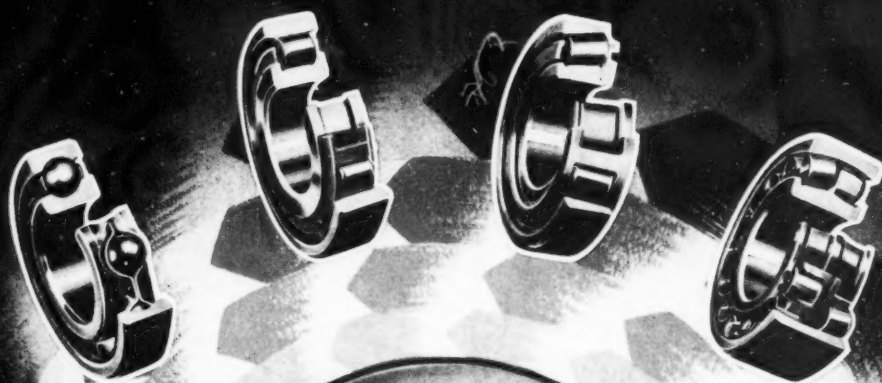


MACHINERY

MAY 16, 1958

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THE SKEFKO BALL BEARING COMPANY LIMITED · LUTON · BEDS

THE ONLY BRITISH MANUFACTURER OF ALL FOUR BASIC BEARING TYPES: BALL, CYLINDRICAL ROLLER, TAPER ROLLER, & SPHERICAL ROLLER

**Straight through
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"Do the job properly—
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Where heat-treatment is concerned—are you doing the job as economically as possible? It's surprising the number of people who invest in expensive machine tools—and then spoil a good job in outdated furnaces. And the result? Rejects—time, money and probably customer goodwill lost. More and more people are relying on Wild-Barfield equipment. Write for full details of the Wild-Barfield range and see how you can save by changing to modern, electric furnaces.

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FOR ALL HEAT-TREATMENT PURPOSES

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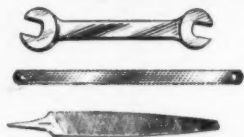
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ALL your needs in Engineers' Small Tools, Macrome Treated Tools, Hand and Power Tools from ONE SOURCE. The time, effort, thought and paperwork entailed by piecemeal ordering saved permanently by the single decision *tools from Hallmac*. Rationalise your buying by making use of Hallmac's immense and comprehensive stock ranges and of their countrywide distribution and service network.



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Whether a component weighs a few pounds or some tons, is convenient to handle or as awkward as the ship's screw illustrated, keyways can be more accurately and quickly cut on Frömag keyseating machines. These machines are available in three models covering keyway requirements from $\frac{1}{8}$ " to 10" in width and with mechanical or fully hydraulic drive. Beside being self-aligning, vertical broaching eliminates deadweight and side pressure on the tool, and therefore ensures greater accuracy and longer tool life. Frömag keyseating machines effect economies in the production of keyways in large or small batches of work and are economical in vital floor space saving.

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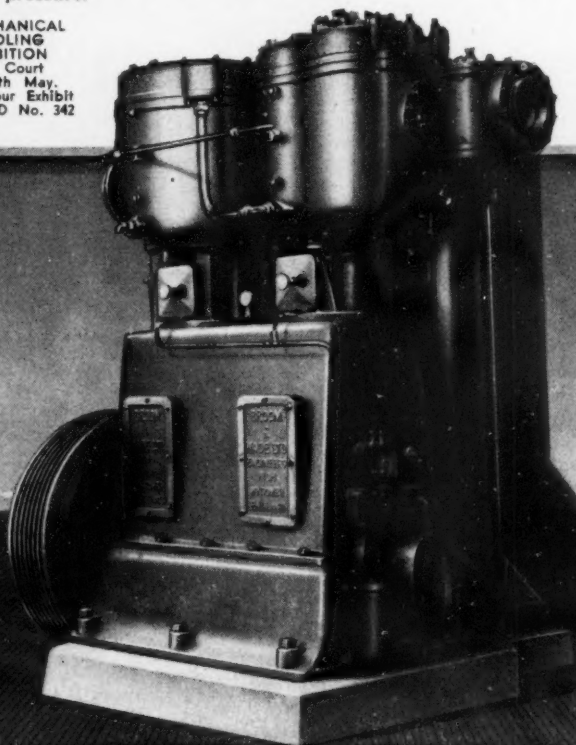
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Famed for **RELIABILITY** and **LONG LIFE**, "BROOMWADE" Air Compressors soon repay their initial cost. Simple design, slow speeds and adequate cooling ensure high efficiency. Constant research and development steadily improve performance.

Illustrated is the "BROOMWADE" Type TS&X Two-Stage Double-Acting Air Compressor supplying 1000 cu. ft. Free Air per minute at 100 lb. per sq. in. pressure.

MECHANICAL
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EXHIBITION
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See our Exhibit
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"BROOMWADE"

STATIONARY AIR COMPRESSORS

Your Best Investment

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Telephone: High Wycombe 1630 (10 lines) Telegrams: "Broom," High Wycombe, Telex.
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'REGALOX' TEST PIECE
SENT ON APPLICATION

Let our "REGALOX" technical development advisory service tell you how "REGALOX" can be applied to your products, your production and maintenance.

HARD CERAMICS FOR ENGINEERING



NEARLY DIAMOND HARD



WEAR & HEAT RESISTANT • DIMENSIONALLY STABLE UNDER ALL CONDITIONS • LOW CO-EFFICIENT OF FRICTION • HIGH PHYSICAL PROPERTIES

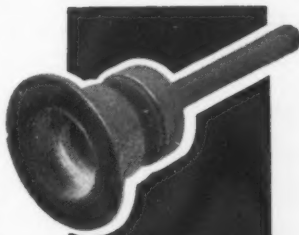
With a hardness between diamond and sapphire, highly resistant to wear and possessing excellent physical properties, "REGALOX" hard ceramics now open up new possibilities in the fields of Chemical, Electrical and Mechanical Engineering.

Unaffected by high working temperature, "REGALOX" remains dimensionally stable under all conditions. It holds close dimensional tolerances and concentricity. It is impervious to moisture and withstands the action of practically all chemicals. Where required, components can be high temperature metallised—a process which has already had a wide application in the Electronics field.

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Industrial Ceramics Division

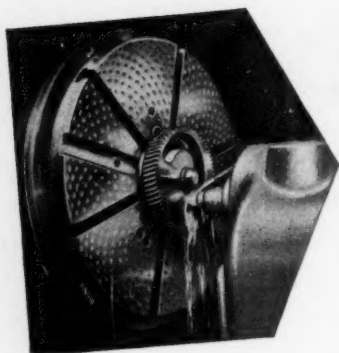


REGALOX SEALED TO
METAL UNDER VACUUM
GIVING POSITIVE
ADHESION

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INDUSTRIAL CERAMICS DIVISION

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Entirely NEW Development
in MACHINE CONSTRUCTION
for **CAM MILLING**

Type HRF 500



**HYDRAULIC
COPYING FROM
SIMPLE TEMPLATE**

**PLANETARY GRINDING
SPINDLE**

**AUTOMATIC FEED
REGULATION**

**SWINGING LEVER
COMPENSATION**

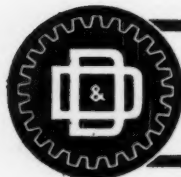
Note the rigid construction
which imparts a high degree of
finish and accuracy coupled with
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**Technical
Data**

Face plate diameter	500 mm (19½")
Maximum milling diameter for plate cams	600 mm (23½")
Maximum milling diameter for cylindrical cams	
(Standard)	260 mm (10¼")
(Special)	350 mm (13¾")
Maximum height of cylindrical cams	300 mm (11¾")
Maximum milling diameter for plate milling	750 mm (29½")
Central hole in the face plate, diameter	100 mm (3.937")
Milling spindle bore ISA taper	13"

**Send for detailed
Catalogue**

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IN THE SAME TEST—

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A lever disconnects the generating drive for normal cylindrical grinding.

A lever disconnects the generating drive for normal cylindrical grinding.

A lever disconnects the generating drive for normal cylindrical grinding.

...BUT THIS FORM REMAINED INTACT

MANURHIN
POLYGON
PROFILE AND
CYLINDRICAL GRINDER

The technical brochure is most interesting — why not write for one?

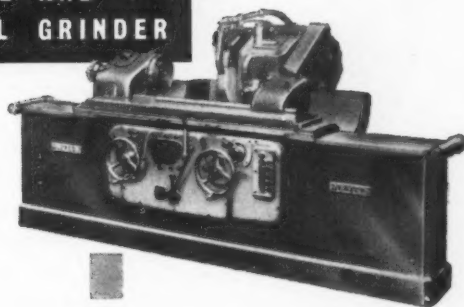
CYLINDRICAL GRINDING

Max. external dia. *4.33". Max. internal dia. 11.7".

TRIANGLES

Max. difference inscribed and circumscribed circles .788". Max. external dia. *4.33". Max. internal dia. *4.33". Distance between centres 31½".

* Figures given for 17" wheel. Can be increased with wheel of smaller diameter.



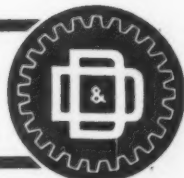
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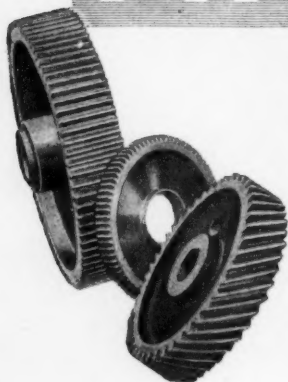
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PRODUCTION GEAR HOBGING MACHINE

Largest in our range of automatic hobbing machines, the PH30 is characterised by its massive construction, thus eliminating any possibility of vibration at the highest production rates. Of the moving table type, it is designed to meet modern high speed production techniques for a wide variety of spur and helical gears up to 30 inches diameter.

Cutting cycle fully automatic, easily set, controlled by single push button. Hydraulic clamping eliminating manual operation. All controls carefully located for quick and simple operation.

Also supplied for manual operation. Optional universal hob slide permits the generation of worm wheels by the tangential feed method.

Full details are given in Publication M107.1

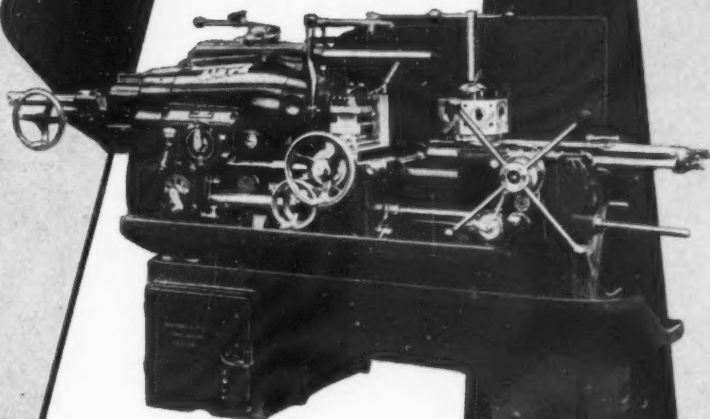
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For Maximum Production

**THE NEW
3C
CAPSTAN LATHE**

Ward



*Many new
features
include:*

- INBUILT ELECTRICAL EQUIPMENT
 - 12 SPINDLE SPEEDS
BOTH FORWARD & REVERSE
 - HIGHER CENTRES GIVING
INCREASED SWING
 - LARGE CAPACITY
SWarf PAN
 - BED PROTECTED BY
STAINLESS STEEL
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- 1 1/2 IN. BAR CAPACITY.

Full details of our complete range of
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**H·W·WARD & CO
LTD**

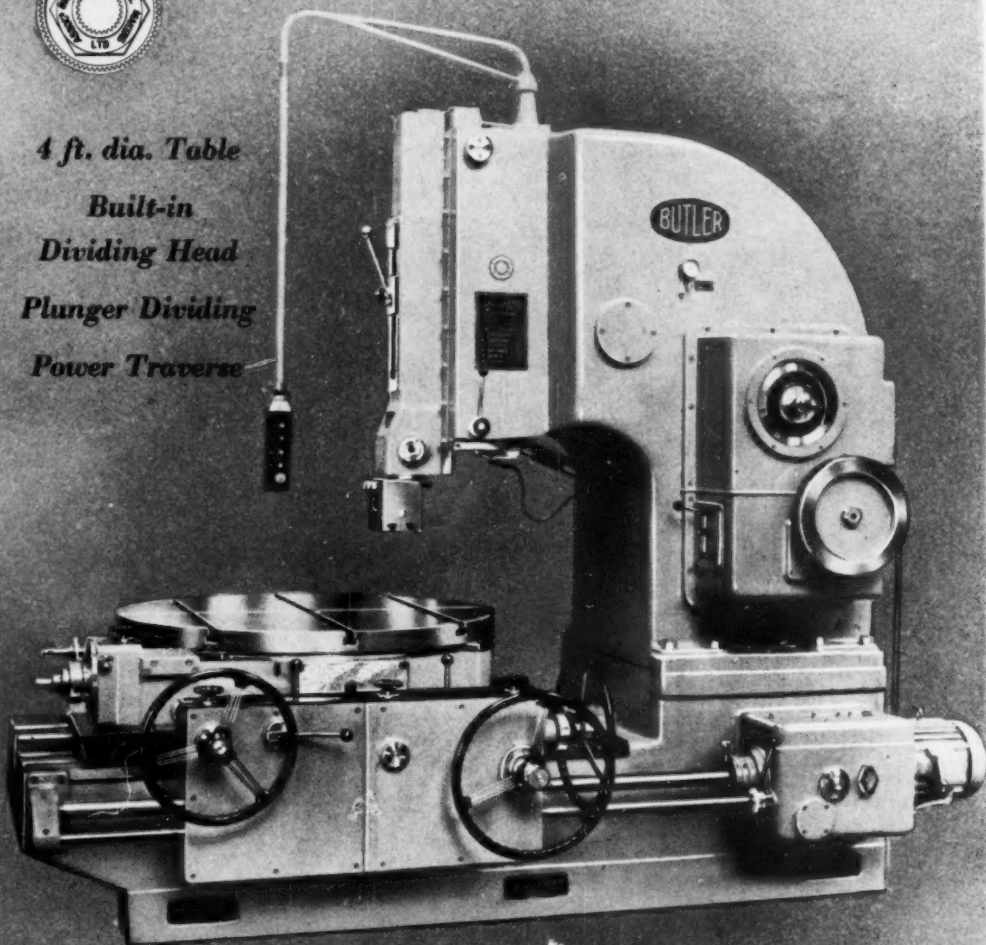
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4 ft. dia. Table
Built-in
Dividing Head
Plunger Dividing
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A NEW BUTLER PRECISION SLOTTER
16" stroke

The **BUTLER MACHINE TOOL CO. LTD.**

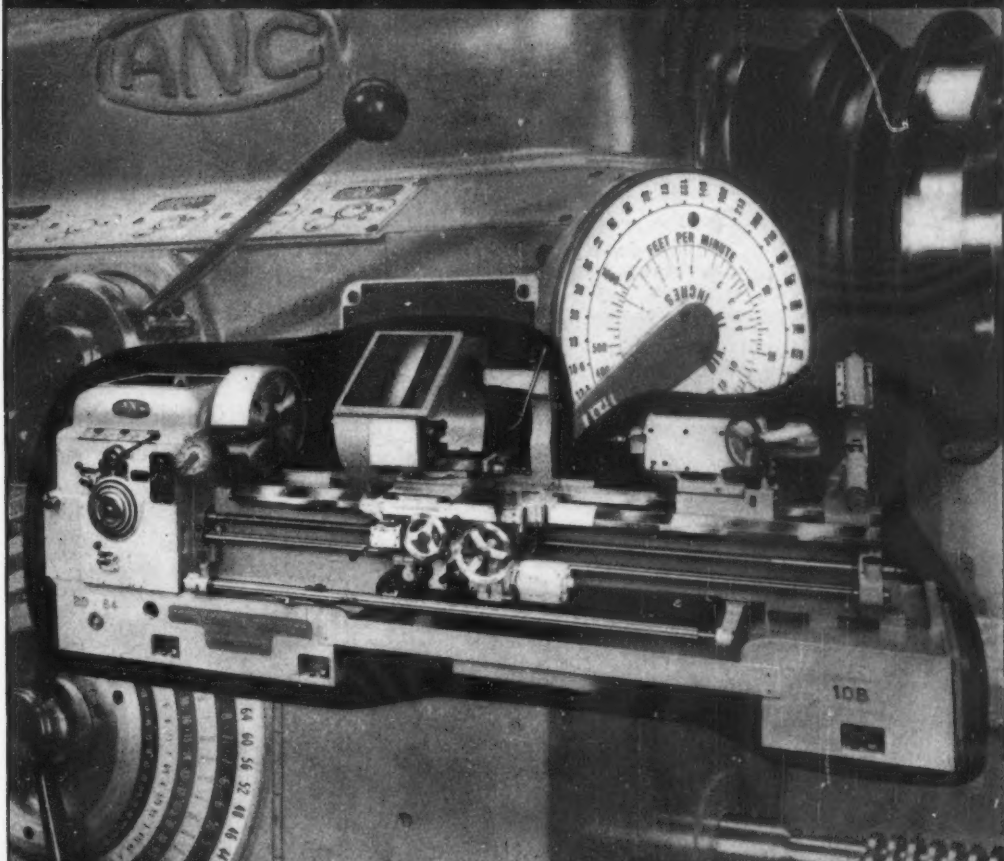
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PLANERS
SHAPERS
SLOTTERS

model B sliding surfacing and screwcutting lathes. 16" to 24" swing.

24 forward and reverse spindle speeds.
60 normal feeds plus 60 fine feeds.
Single lever operation.

Preselection of cutting speeds,
feeds and threads on direct
reading dials.



More production per man-hour is the only answer to increasing production costs.
A model B lathe is the answer to greater production per man-hour



for **LATHES**

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JOHNSTONE

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Telegrams: "Lang Johnstone"

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MACHINE TOOL MAKERS LTD.
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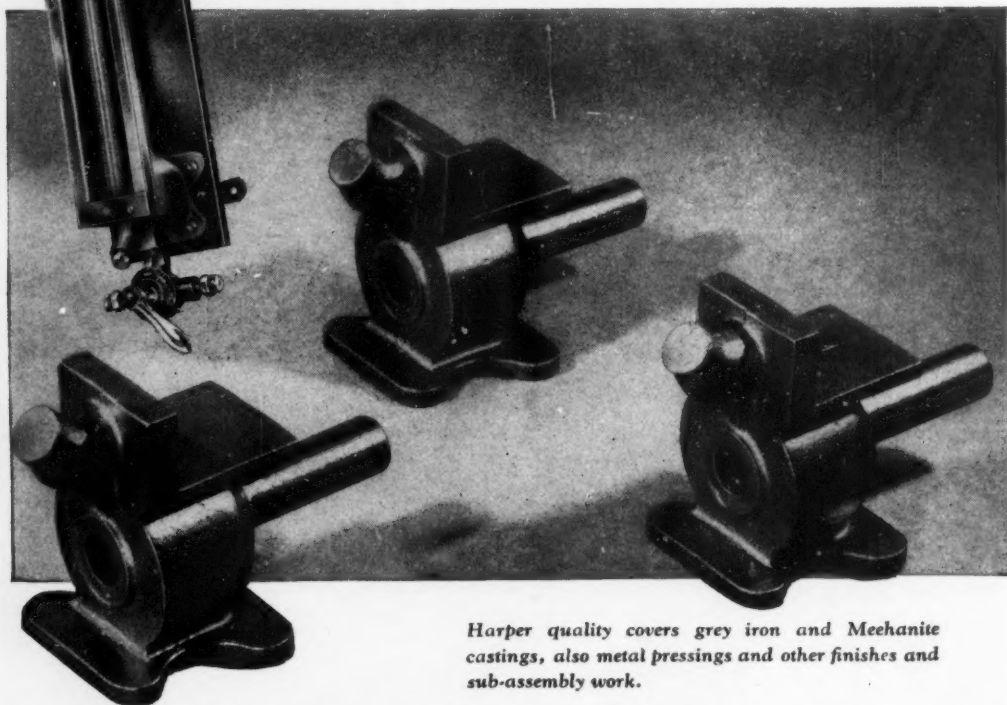
To ensure high standards of accuracy—
KELVIN & HUGHES rely on

HARPER CASTINGS

Kelvin & Hughes provide high standards of accuracy in the Pneumercator liquid level tank gauge, which is in extensive use in a wide variety of industries and on board ship. Amongst its many applications it can be used to indicate storage levels, regulate plant operation and show the draught of a ship or a floating dock.

Their Chief Engineer says of Harper Castings:-

- They have consistent accuracy of dimensions
- The extremely good skin finish reduces machining
- They machine with ease
- They are absolutely free from porosity so essential for this application
- The rejection factor is extremely low



Harper quality covers grey iron and Meehanite castings, also metal pressings and other finishes and sub-assembly work.



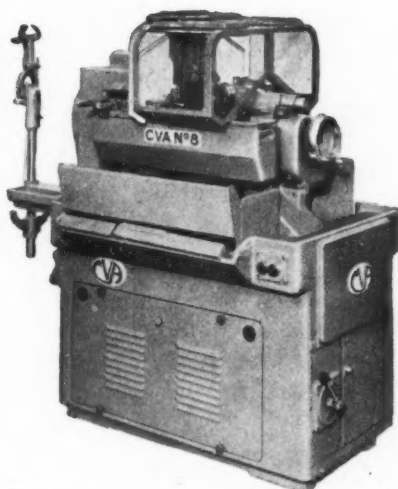
JOHN HARPER & CO. LTD. JOHN HARPER (MEEHANITE) LTD.
ALBION WORKS Phone: WILLENHALL 124 (5 lines) Grams: HARPERS, WILLENHALL **WILLENHALL**

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*Designed to provide
maximum output with
low capital outlay*

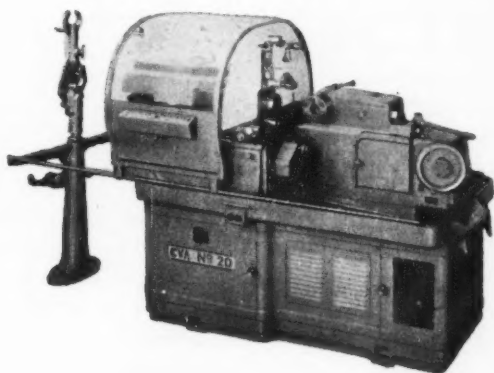
No. 8: $\frac{1}{2}$ " CAPACITY (13 mm)

Speed range 7,250 to 37 r.p.m. Multi-ratio two-speed gearbox. Positive, powerful toothed-belt drive. 3 h.p. foot-mounted motor. Easy-change feed gearbox—fixed centres. Central power lubrication system.

**SINGLE
SPINDLE**



AUTOMATICS



No. 12: $\frac{3}{4}$ " CAPACITY (20 mm)

Speed range 5,650 to 30 r.p.m. Multi-ratio four-speed or two-speed gearbox. 5 h.p. reversible motor. Dual power lubrication system.

No. 20: $1\frac{1}{2}$ " CAPACITY (32 mm) ($1\frac{1}{2}$ " with outside feeding)

Speed range 3,500 to 18 r.p.m. Multi-ratio four-speed or two-speed gearbox. Simplex chain drive. 7½ h.p. foot-mounted motor. Easy change feed gearbox—fixed centres. Dual power lubrication system.

No. 26: $1\frac{3}{4}$ " CAPACITY (42 mm) ($1\frac{3}{4}$ " with outside feeding)

Speed range 3,100 to 16 r.p.m. All other features as C.V.A. No. 20.

**E.H. JONES
(MACHINE TOOLS) LTD**

GARANTOOLS HOUSE
PORTLAND ROAD, HOVE, SUSSEX

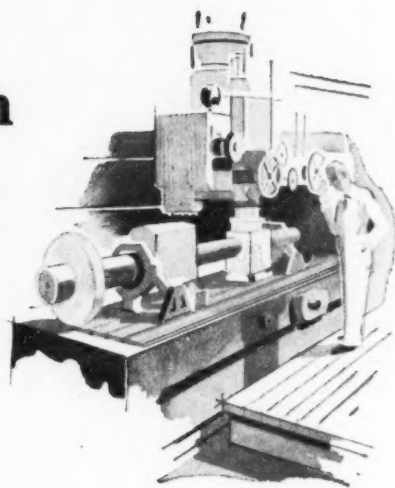
Telephone: HOVE 47253 Telegrams: Garantools, Portslade

LONDON · BIRMINGHAM · EDINBURGH · MANCHESTER · BRISTOL

· Rainbow 1260

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Does the component finish leave something to be desired?



Amongst the factors influencing the degree of finish obtained on the workpiece, one of the most important is the cutting fluid used. The selection of the right cutting fluid for the job can make all the difference. That is where the wide FLETCHER MILLER range of cutting fluids is of service. In this series, there are many soluble and straight oils, all with definite uses and characteristics. From this range can be chosen the correct lubricant for any metal cutting operation. In many cases it has been found possible to improve the finish on machined parts and to increase the speed of output, merely by changing to the appropriate FLETCHER MILLER cutting fluid. It is worth investigating. As a first step, send for publication SP.173 which describes in detail the various FLETCHER MILLER fluids.

Change now to

FLETCHER MILLER

cutting fluids

**YOUR
PARTNERS
IN
PRODUCTION**

FLETCHER MILLER LTD., ALMA MILLS, HYDE, CHESHIRE.

Telephone: HYDE 3471 (5 LINES)

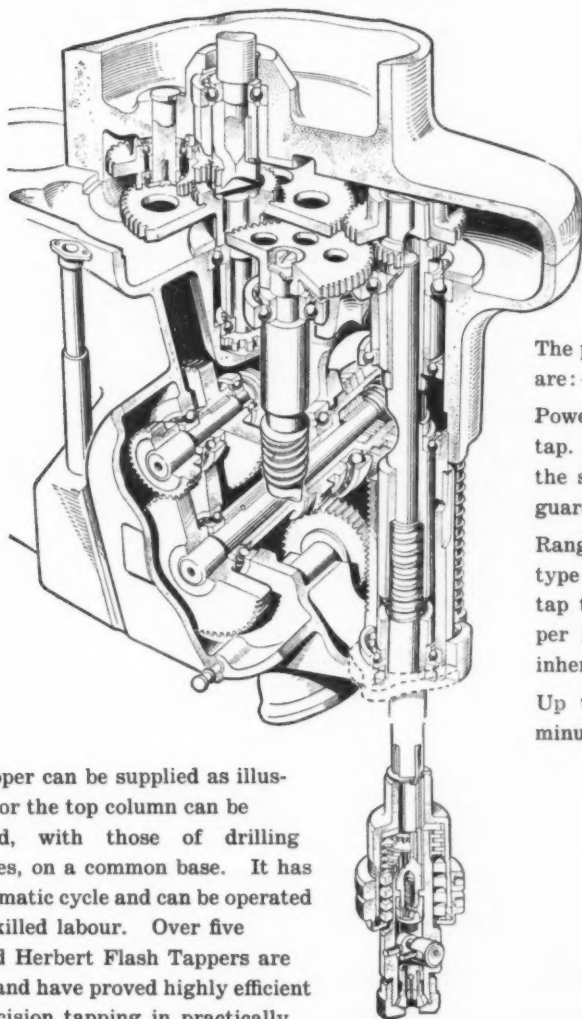
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Also at LONDON, WEST BROMWICH, NEWCASTLE-ON-TYNE, CARDIFF, GLASGOW AND BELFAST

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HERBERT No. 2 Flash Tapper

for precision tapping up to $\frac{1}{2}$ " Whitworth in mild steel



The tapper can be supplied as illustrated, or the top column can be mounted, with those of drilling machines, on a common base. It has an automatic cycle and can be operated by unskilled labour. Over five hundred Herbert Flash Tappers are in use, and have proved highly efficient for precision tapping in practically all materials.

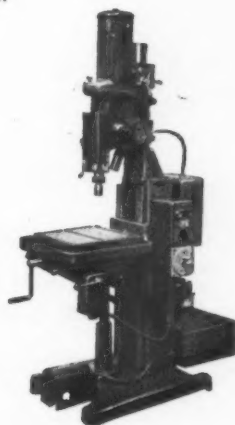
*Now available for
Early Delivery*

The principal features of this machine are: —

Power feed to the spindle sleeve and tap. Adjustable slipping clutches in the speed and feed mechanisms safeguard against tap breakage.

Range of speeds and feeds and collet-type tap holder enable the machine to tap threads from 48.5 to 11 threads per inch. Ensures in the work the inherent accuracy of the taps used.

Up to 30 holes can be tapped per minute.



ALFRED

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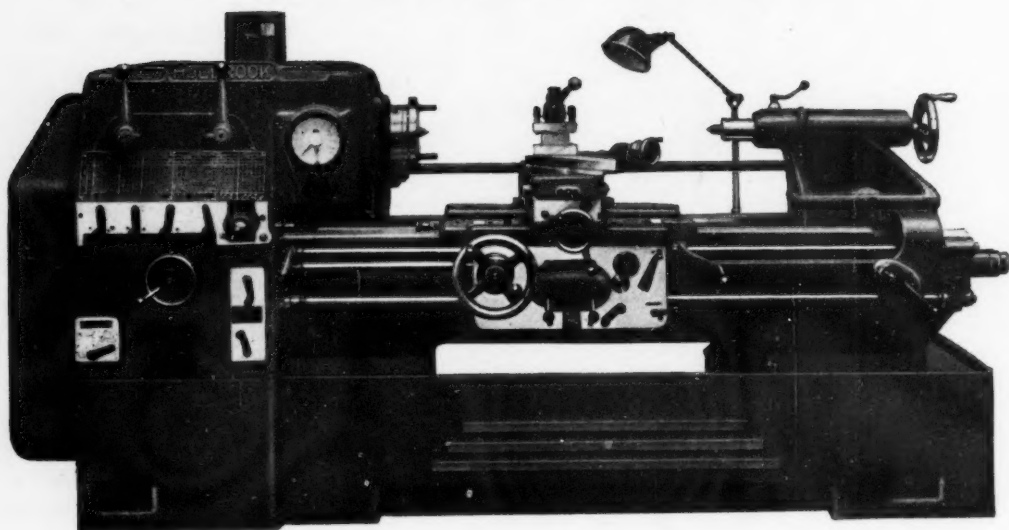
LTD., COVENTRY

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Holbrook

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MODEL "U" No. 17

MODEL "U"

PRECISION TOOL-MAKERS' LATHES

BUILT-IN RELIEVING EQUIPMENT WITH INFINITELY VARIABLE RISE CAM
AND NO CHANGE-OVER REQUIRED FOR ORDINARY TURNING

INFINITELY VARIABLE SPINDLE SPEEDS IN FOUR GROUPS
(NOT ELECTRONIC)

REVERSE TO SPINDLE ON ALL SPEEDS

FULL RANGE OF ADDITIONAL EQUIPMENT, INCLUDING PITCH
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3 SIZES, NOMINAL SWING 13 - 17 - 21 INCHES

The Finest Lathe in its Class

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THE

"CONCENTRE"

COMBINED CARBIDE TOOL GRINDER

**WITH MOTORIZED
CHIP-BREAKER
GROOVE GRINDING
UNIT**



EQUIPPED WITH UNIVERSAL TOOLHOLDER

The Chip-breaker Groove Grinding Unit on the Abwood CG2/CB accommodates almost every shape and size of turning tool. Its robust design allows accurate grinding of grooves of desired radius and size with extreme accuracy and perfect finish.

UTILIZES DIAMOND WHEELS TO THEIR MAXIMUM EFFICIENCY

The ABWOOD range of Carbide Tool Grinders includes:

MODEL No.	WHEEL SIZES	AVAILABLE WITH:
CG0	6in.	Bench or Pedestal.
CG1	8in.	—
CG2	8in.	{ Chipbreaker Grooving Attachment.
CG3	12in.	{ Motorised Chip-breaker Unit
CG2/CB	8in.	
CG3/CB	12in.	

ABWOOD MACHINE TOOLS LTD., PRINCES RD., DARTFORD, KENT

Telephone: Dartford 5271 (5 lines)

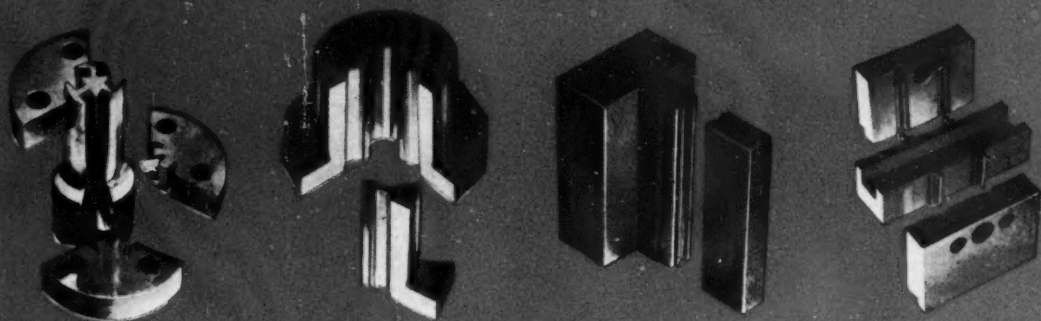
Telegrams: ABWOOD, DARTFORD



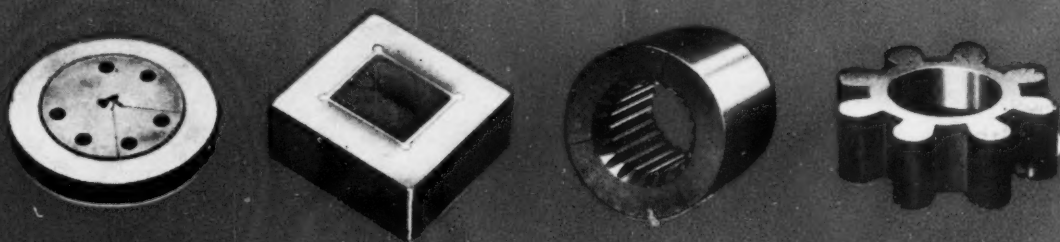
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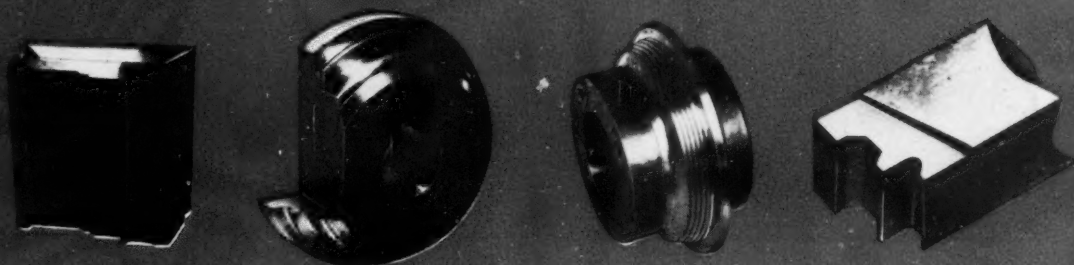
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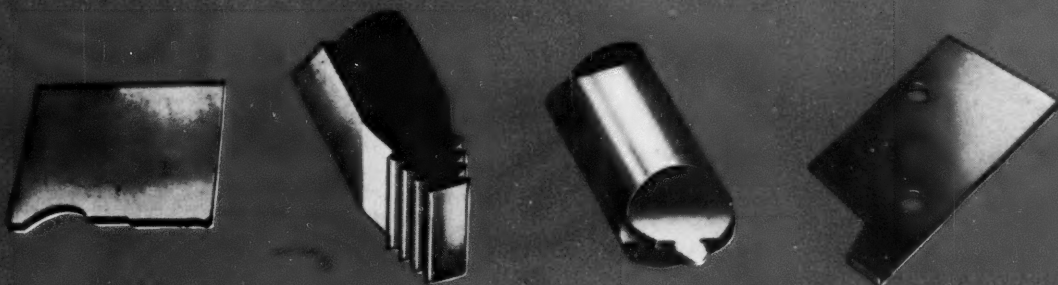
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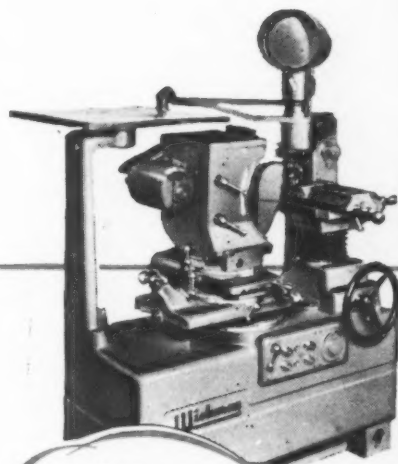


***When versatility and accuracy
are important***

The range of application possible on the Wickman Optical Profile Grinding Machine is well-nigh limitless. And because templates and formed wheels are not required, single components can be produced quickly with the minimum risk of lost accuracy.

Many years' experience with operators possessing varying degrees of skill has shown that with normal attention forms can be produced to a reliable plus or minus tolerance of 0.0005" and with special care to within 0.0002".

***. . . here's the answer to
form grinding problems***



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MACHINE TOOL DIVISION, BANNER LANE, COVENTRY

Telephone: Tile Hill 66271

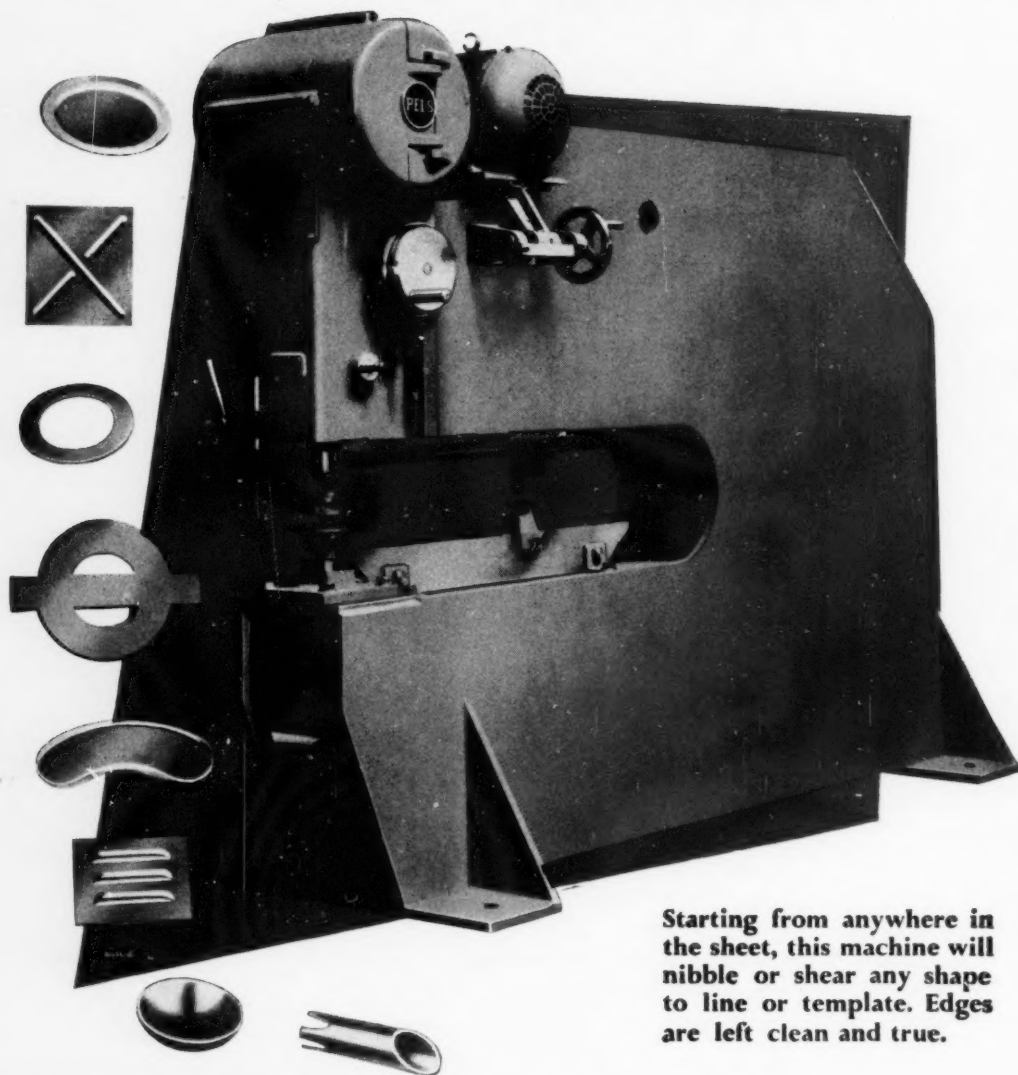
490 WMG



**The New
COMBINED High Speed SHEARS & NIBBLER**

Type ASQ-8

FOR 5/16" PLATE (NIBBLING TO 1/4")



Starting from anywhere in the sheet, this machine will nibble or shear any shape to line or template. Edges are left clean and true.

HENRY PELS & CO. LIMITED

Offices & Showroom 32-38 OSNABURGH STREET · LONDON · N.W.1

Telephone: EUSTON 4113



WILKINS & MITCHELL

*The
Presses
that*
**CUT
COSTS**

WILKINS & MITCHELL LTD., DARLASTON, SOUTH STAFFS, ENGLAND

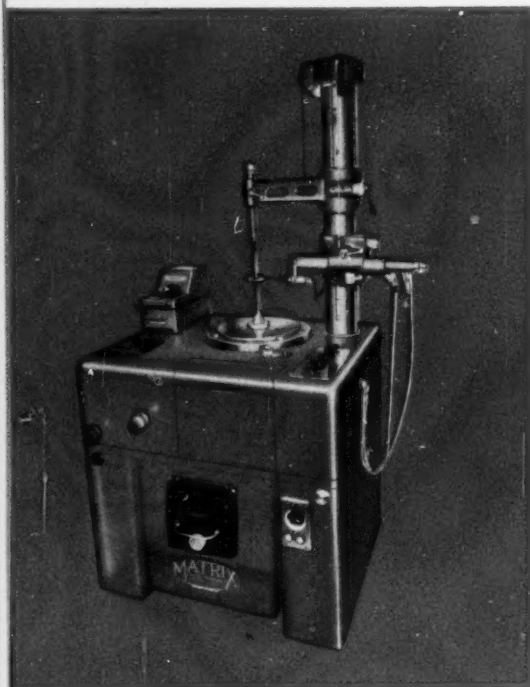
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May 16, 1958

Leads again **WITH**

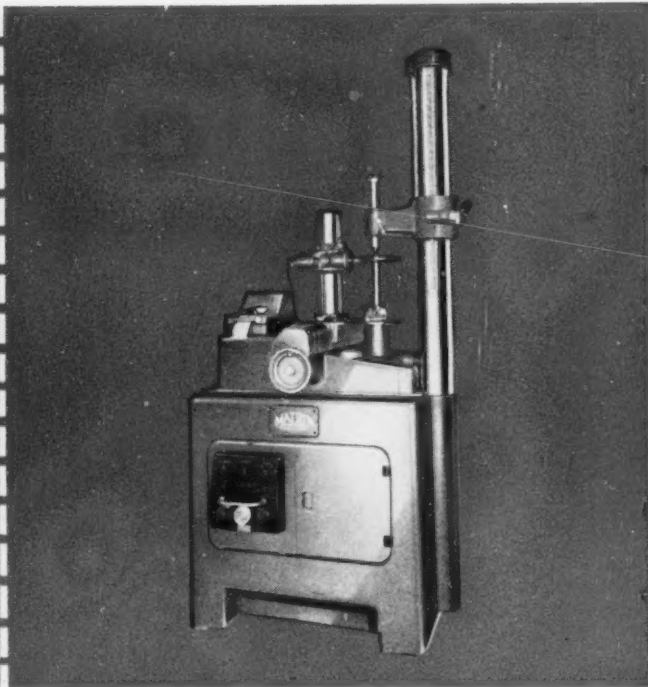


AUTOMATIC GEAR TOOTH SPACE AND CONCENTRICITY CHECKING MACHINE (above)

Developed from an original design by the Mechanical and Engineering Laboratory, this machine is an essential requirement in all modern gear-producing plants. It combines a very high degree of accuracy with a significant reduction in the time required for inspection of gears.

Automatic in operation, it will measure a gear completely for tooth-spacing or for pitch circle concentricity as required, recording the results on a graph.

It can accommodate gears up to 12in. in diameter.



INVOLUTE GEAR FORM MEASURING MACHINE (above)

This machine is designed for quick and accurate gear measurement, both during production and final inspection, a factor of vital importance to the manufacturer supplying precision gears at competitive prices.

Using a straight edge operating against a base circle disc, it will measure the form of spur and helical gears up to 12in. (300 mm.) diameter. Gears may be mounted on mandrels or on shafts up to 24in. (600 mm.). Completeness of design enables this machine to check all types of gears within its capacity without the necessity for additional equipment such as index plates or master plates.

UNIVERSAL MEASURING MACHINE (not illustrated)

The manufacturers of large engineering components will readily appreciate the ever-growing need for means to ensure more accurate control of their products.

The advent of the Universal Measuring Machine will be hailed as a further advance in this direction.

This machine has been designed to accommodate work of dimensions well beyond the capacity of normal measuring instruments, and to enable an extremely high degree of accurate production to be maintained.

Coventry Gauge

& TOOL COMPANY LTD

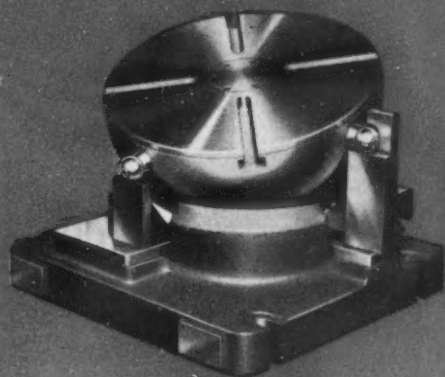
P.O. BOX 39, COVENTRY, CT BRITAIN



SEE US ON STAND 57



NEW MEASURING INSTRUMENTS



HIGH PRECISION COMPOUND ANGLE SINE TABLE (above)

An outstanding new feature presented by this table is the use of a hemisphere riding in a conical seating, instead of the conventional hinged bearings at 90° .

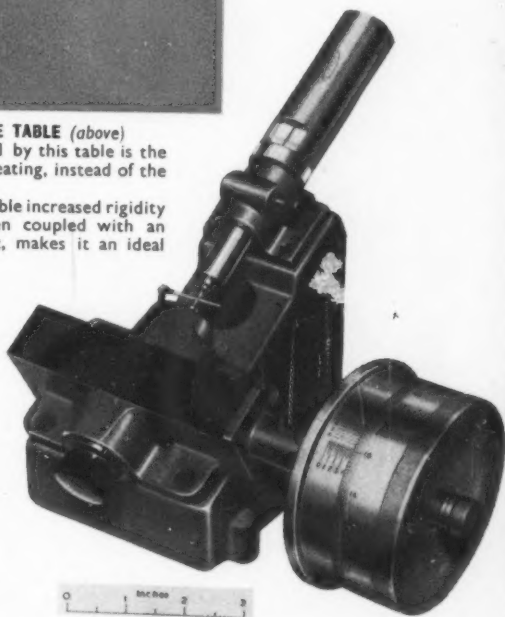
This improvement in design gives the table increased rigidity and an ease of operation which, when coupled with an accuracy to within ten seconds of arc, makes it an ideal accessory for use in connection with the jig-boring operations or precision inspection.

SMALL PRECISION COMPARATOR (right)

Based on an original design by the National Physical Laboratory, this simple high precision instrument is intended for the accurate measurement of small cylindrical components.

It combines the use of a micrometer and a fiducial indicator mounted at 90° to one another on a base casting with its upper surface inclined at 30° to the horizontal, for convenience in sighting work between the anvils.

Operation of the measuring anvil by a tapered tungsten carbide wedge coupled to the micrometer spindle gives the comparator a very high degree of accuracy.



G.A.T.M.A. EXHIBITION MAY 12th TO THE 21st

WHEN USED FOR BORING

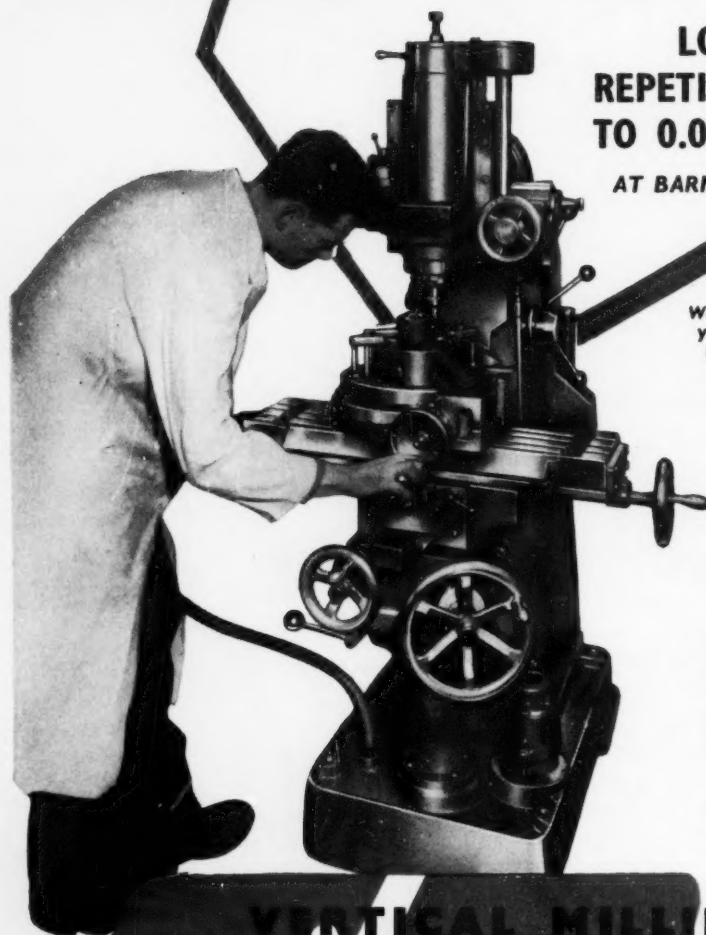
**LOCATES WITH
REPETITIVE PRECISION
TO 0.0005"**

AT BARNETT BROS. (GUILDFORD) LTD

We purchased this machine just over a year ago and it has been in constant use since then: it has given no trouble whatsoever,

We have the standard measuring equipment and with this we are spacing holes on jigs to ± 0.0005 " of nominal position.

- Spindle hardened and ground on Timken precision roller bearings.
- Head with 3in. power down feed, can be swivelled through 360 deg.
- Table feed, automatic 18in
- Cross feed 6½in., vertical 14½in., both hand.
- Spindle to table 15in.
- Spindle speeds 50 to 1,000 r.p.m.
- Table working surface 30in. by 8½in.



VERTICAL MILLING MACHINE
milnes
WITH POWER DOWN FEED
& GAUGE BLOCK MEASURING
EQUIPMENT.

HENRY MILNES LIMITED
INGLEBY WKS., ROSSE ST., BRADFORD 8, YORKS

ESTABLISHED 1858

PHONE BRADFORD 41301

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WORM REDUCTION DRIVE PLANING MACHINE

At last!
-- a low priced machine
with a high priced
machine's performance



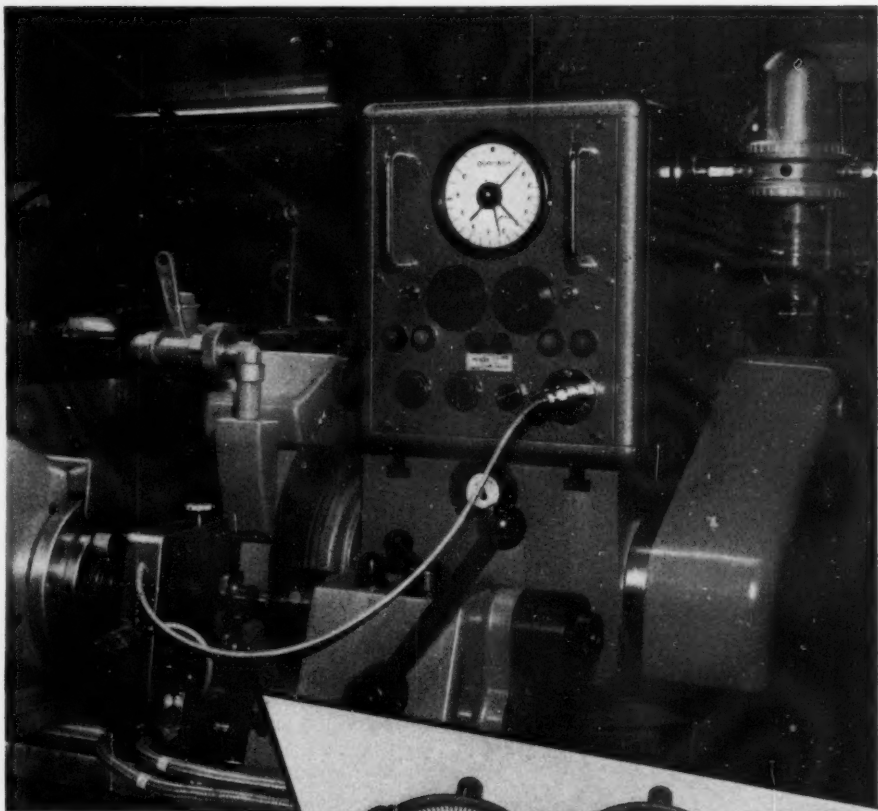
planers

planers
HUDDERSFIELD

MADE IN FOUR SIZES ONLY
6'2" x 26" - 8' x 26" x 26"
8' x 30" x 30" - 8' x 30" x 30"

GOOD DELIVERIES

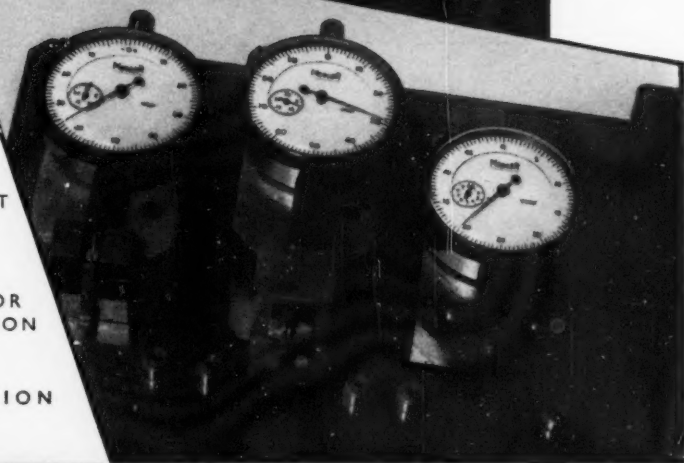
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STAND 15A
PRODUCTION EXHIBITION
OLYMPIA. MAY 12-21
On show, as above . . . THE
New MERCER AIRMATIC
SIZING CONTROL EQUIPMENT

Right . . .
MERCER DIAL GAUGES FOR
MULTI-GAUGING INSPECTION
On show at . . .

STAND 123
GAUGE & TOOL EXHIBITION
OLYMPIA. MAY 12-21



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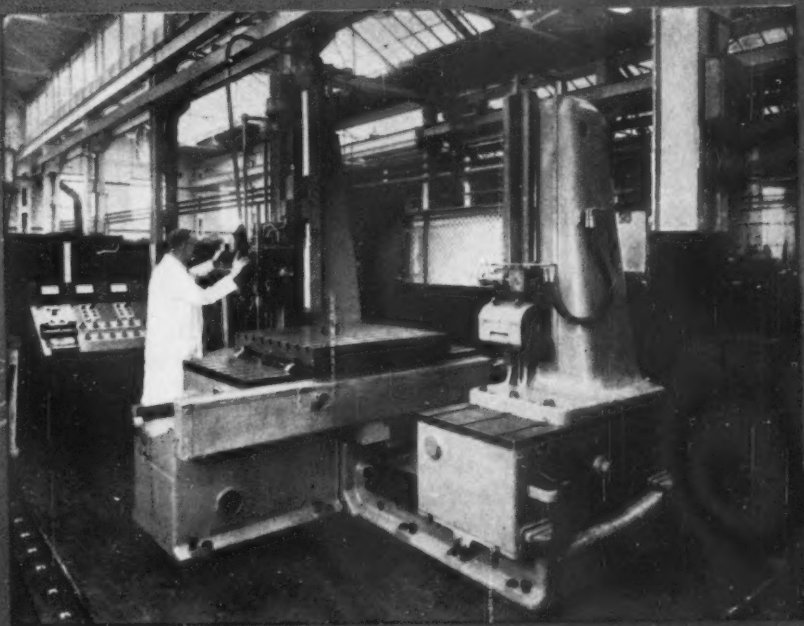
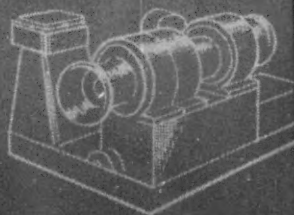
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Keelavite HYDRAULICS



On the Keelavite Electronic No. O Planer Table Type Machine fitted with the British Thomson-Houston automatic co-ordinate setting system, the slide clamping units are actuated by Keelavite hydraulics working in an electronically controlled machine sequence. All hydraulic units except the cylinders are housed in a control cabinet at the rear of the machine.

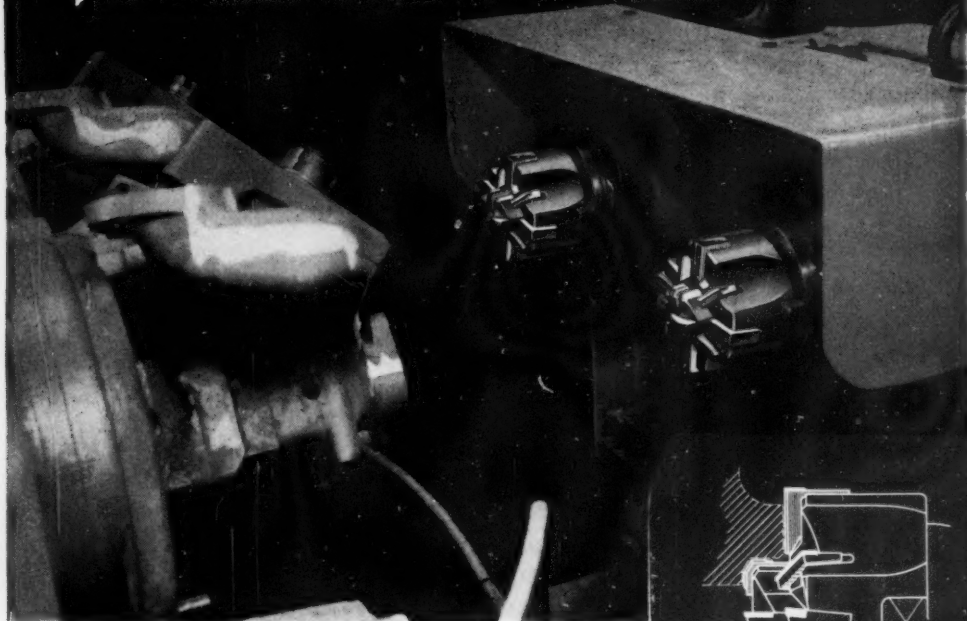
A comprehensive standard range of hydraulic power and control equipment backed by circuit design, installation and after-sales services.

KEELAVITE ROTARY PUMPS & MOTORS LTD., ALLESLEY, COVENTRY

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THE RECOGNISED AUTHORITY ON HYDRAULIC POWER TRANSMISSION

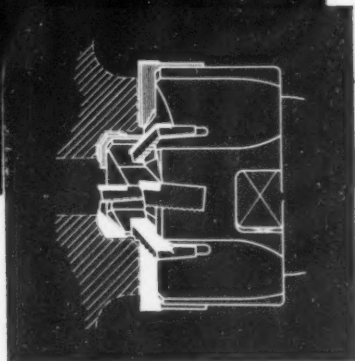
Special combination cutters reduce production times at Vauxhall



Galtona
O-K

serrated blade cutters

For faster production of exhaust manifolds, Vauxhall Motors Limited, turn to "Galtona-O.K." combination tools, designed specially for boring, chamfering and facing at one pass. The cutter blades are tipped with cemented carbide. The facing cutter is $3\frac{1}{2}$ in. diameter, and that for counterboring and chamfering, 1 in. diameter, operating at 70 R.P.M. with 0.011 in. feed and 140 R.P.M. with 0.02 in. feed, respectively. A step-down motor enables this to be achieved. An exceptionally long life is obtained on this operation between grinds. Why not let our Tool Engineers assist with your tooling problems?



Stand No. 9
Gauge and Tool Exhibition

Richard Lloyd Limited

GALTON HOUSE, ELMFIELD AVENUE, TYBURN, BIRMINGHAM, 24
Telephone: Ashfield 1801. Telegrams "Cogs. Birmingham"

• Telex. No. 33366.

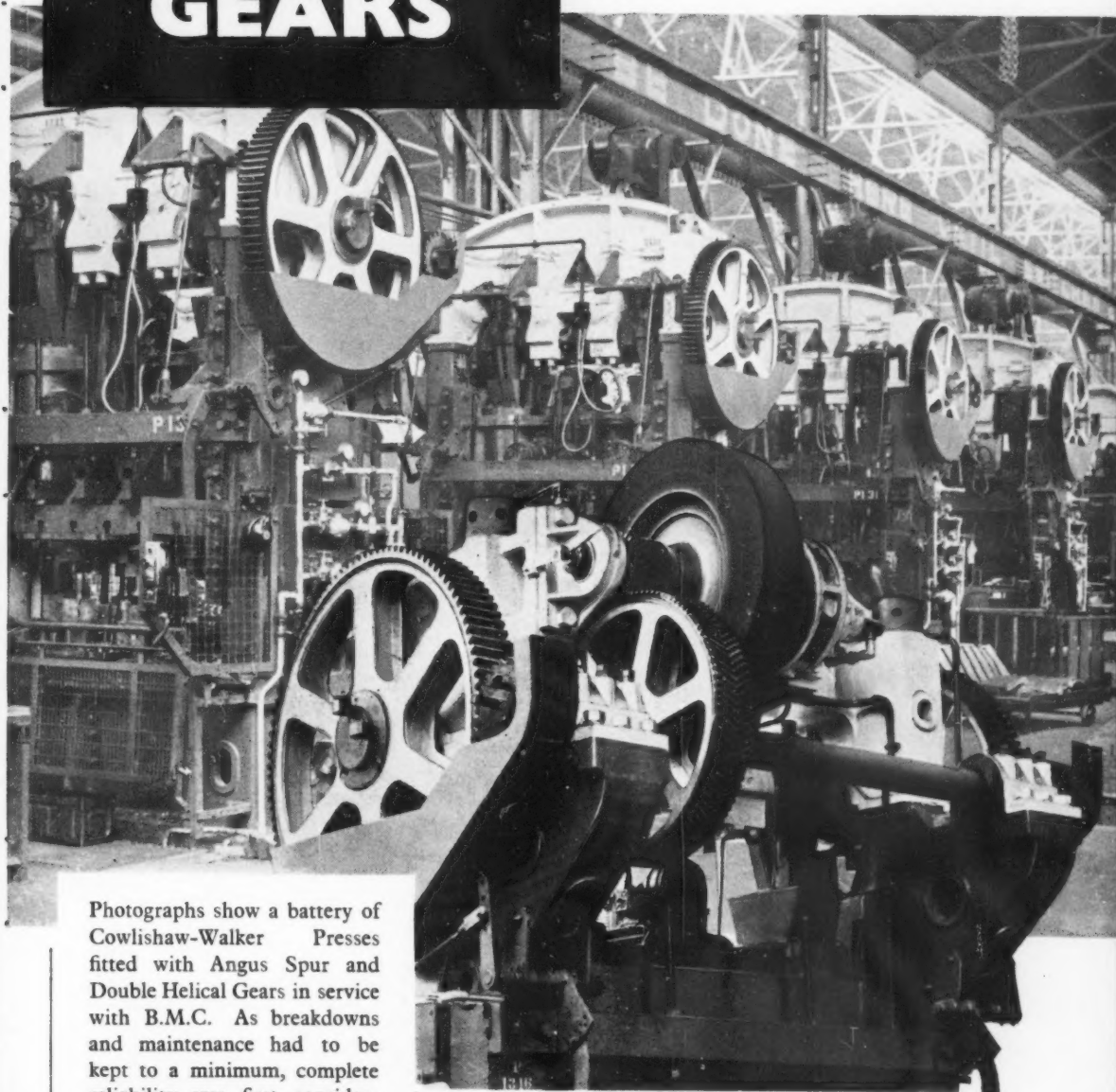
NORTHERN AREA OFFICE: A. V. Green, Britannia House, Wellington Street, Leeds 1 Phone: Leeds 21212
LONDON AREA OFFICE: A. J. Percy, 240 Romford Road, Forest Gate, London, E.7. Phone: MARYland 2564
NORTHERN IRELAND: Garage & Engineering Supplies Ltd., 78 Great Victoria Street, Belfast.
SCOTLAND: Stuart & Houston, 5 York Street, Glasgow C.2.

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Angus

GEARS

FOR RELIABILITY



Photographs show a battery of Cowlshaw-Walker Presses fitted with Angus Spur and Double Helical Gears in service with B.M.C. As breakdowns and maintenance had to be kept to a minimum, complete reliability was first consideration when the choice of gears was made.

Capacities

Spur Gears up to 78in. diameter. Double Helical Gears up to 52in. diameter. Bevel Gears up to 60in. diameter. Worm Gears up to 24in. centres.

GEORGE ANGUS & Co LTD

GEAR DIVISION, Prince Consort Road, Hebburn-on-Tyne.



You should have heard the boffins on that controversial subject the other day. Old boffin Sid for example.

He was saying that titanium satellites and nimonic space ships were fair game for SKY-ACKY welding.

"After all," he said, "saucepans, cages, bicycles, motor cars, missiles and aeroplanes are all SKY-ACKY welded."

"You mean SHE-ICKY welded" squeaked boffin Emanuel. Then all the other boffins joined in: "SHE-ACKY," "SKY-ICKY," "SHI-ARKY," "SKEE-ICKY."

I myself pronounce it *SEE-ACKY*, which is, perhaps, how any self-respecting boffin would pronounce it.

SCIARY ELECTRIC WELDING MACHINES LIMITED, FALMOUTH ROAD, SLOUGH, DUCKS, ENGLAND. TEL: SLOUGH 25651 (10 LINES) CABLES: SCIARYWELD, SLOUGH
Paris Chicago London Birmingham Manchester Christchurch (N. Zealand) Calcutta Johannesburg Capetown Kuala Lumpur Bombay Bangalore Karachi

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**SCREWING
EQUIPMENT**
specialists

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TH. KIESERLING & ALBRECHT GERMANY SOLINGEN

OUR MANUFACTURING PROGRAMME

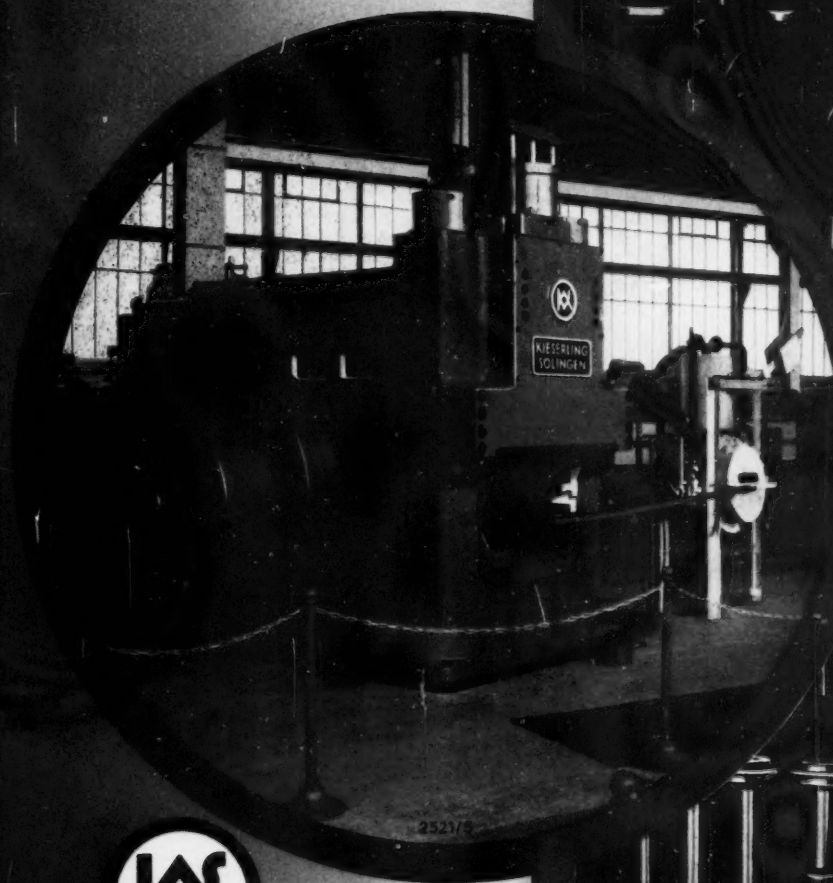
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HORIZONTAL and VERTICAL FORGING PRESSES

SPECIAL MACHINES for the FORGING TECHNOLOGY

MACHINES for the MANUFACTURE of HORSE-SHOES

MACHINES for the MANUFACTURE of SHELLS



British Agents: F. W. Kubach Ltd
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8 machines in one!

THE COMPLETE TOOLROOM MACHINE

- JIG BORING
- DIESINKING
- DRILLING
- HORIZONTAL MILLING
- * VERTICAL MILLING
- * UNIVERSAL MILLING
- * SLOTTING
- * SHAPING

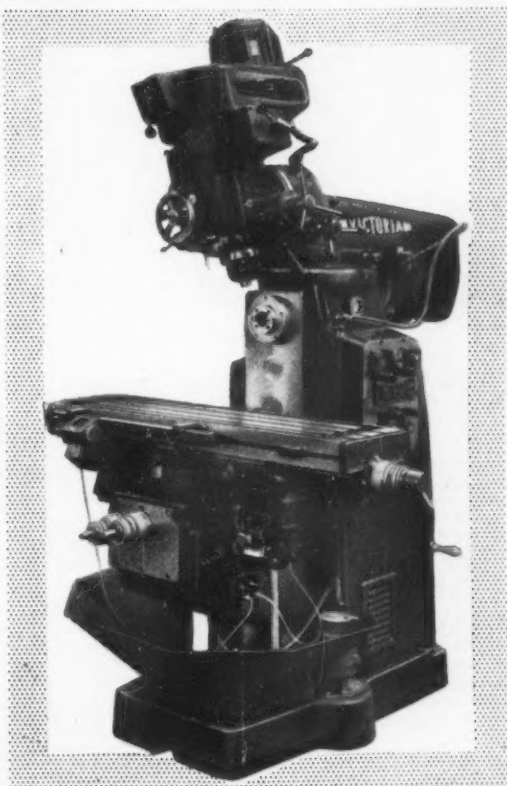
With the VICTORIA 01 or 02 OMNIMIL

and standard attachments * as used with your Victoria U1 and U2 Universal millers.

01—40" x 11" table, power longitudinal table feed, 3 h.p. spindle motor.

02—45" x 11" table, power feed to all table movements, 4 h.p. spindle motor.

Optical measuring equipment as illustrated or dial gauges and measuring rod troughs available as extra equipment.



VICTORIA

OMNIMIL

12 horizontal spindle speeds
31-1010 r.p.m. : 18 table feeds
0.4-12-25 in./min. : 8 vertical
spindle speeds 80-2700 r.p.m. :
3 power feeds .0015", .003"
and .006" with auto trip :
Coarse and micrometer hand
feed.

Write **NOW** for
44 page
Machine Tool Catalogue

B. ELLIOTT (MACHINERY) LTD

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DEVELOPMENT ENGINEER AT LANDIS MACHINE CO. REPORTS . . .

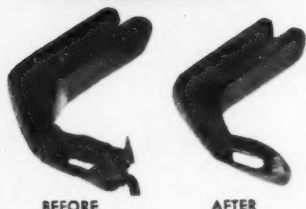
"We cut costs from £20 to 4/- per 100"

by deburring and finishing needle plates with



Mr. James W. Dunford, development engineer at Landis Machine Co., points to location of needle plate in new model of Landis shoe repair machine.

Barrel Finishing Equipment



One of the most successful barrel finishing applications on record at Almco is this needle plate deburring and finishing at Landis Machine Company.

The needle plate forgings are drilled and broached and then carefully deburred and finished. Formerly the cost of finishing and removing the tough burrs by hand filing was £20 per 100.

Now, an Almco Model DB-200 barrel finishing machine performs the same operation at a cost of 4/- per 100, a savings of 99%!

VERSATILE EQUIPMENT

By keeping simple records on processing cycles, correct media and compound, and proper scheduling, Landis engineers can switch the Almco equipment from part to part, to meet plant production requirements exactly.

BROAD EXPERIENCE FOR YOU

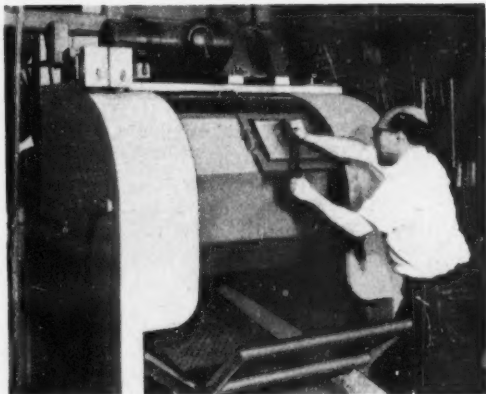
Almco's experience in barrel finishing methods and techniques now covers a wide range of parts, sizes, shapes, metals, and operations. Almco maintains sample processing laboratories for the purpose of analysing product parts and desired results. Let Almco technicians work out procedures to give you the quality you want at the lowest possible finishing cost.

REQUEST YOUR REPORT

Simply write on your company letterhead, requesting an Almco engineer to call on you. Or, send your sample parts and specifications on results direct to Almco. You will receive a detailed report at no obligation.

MANY LANDIS PARTS NOW BARREL FINISHED

With this £1,143 annual saving on needle plates alone in mind, Landis engineers have applied the Almco method to other parts until the company is now barrel finishing several hundred different parts to high quality standards. Rejects are practically non-existent.



Finishing department operator at Landis Machine Co. gets ready for parts deburring run in Almco barrel finishing machine. Almco construction is heavy-duty throughout, to stand up under rugged requirements month after month.

ALMCO Supersheen

BURY MEAD WORKS · HITCHIN · HERTS

Telephone: Hitchin 3669

HOLLAND (Rotterdam) N.V. Technische Handelssonderneming "Carborundum-Aloxite"; BELGIUM & LUXEMBURG (Bruxelles) Technometal Societe Anonyme; SWEDEN (Stockholm) Trumlingsaktiebolaget; SWITZERLAND (St. Gallen) L. Kellenberger & Co.; SOUTH AFRICA (Johannesburg) Barry Colne & Co. (Pty.) Ltd.; AUSTRALIA & NEW ZEALAND (Melbourne) Hardie Trading Ltd.

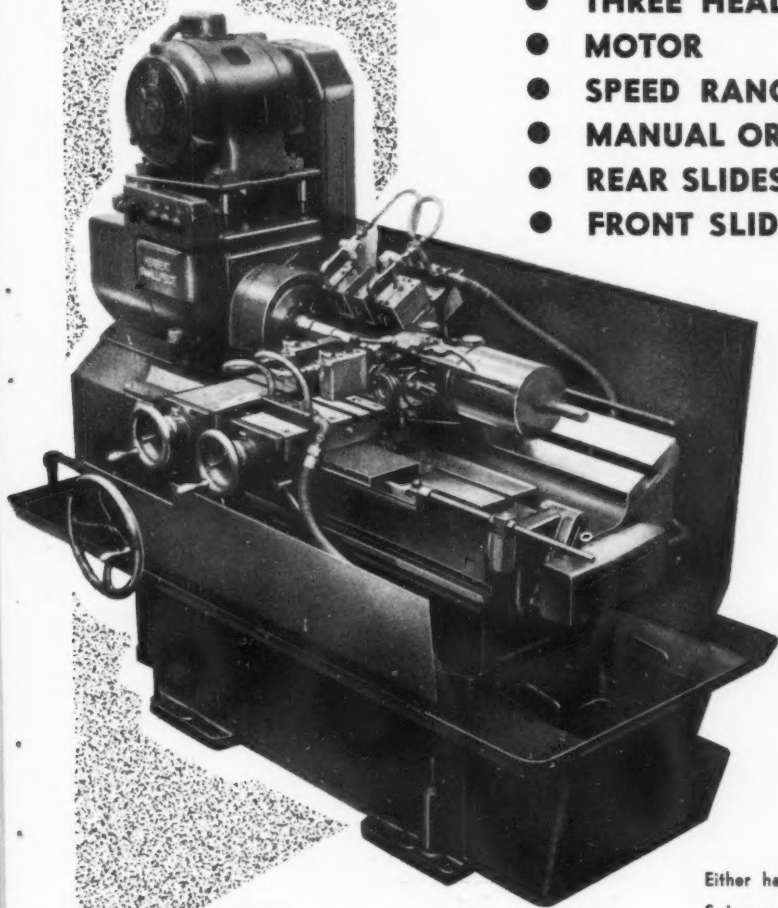
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The most versatile multi-cut Lathe

HERBERT-SMALLPEICE

with a choice of . . .

- **THREE HEADSTOCKS**
- **MOTOR**
- **SPEED RANGE**
- **MANUAL OR AUTOMATIC CYCLE**
- **REAR SLIDES**
- **FRONT SLIDES**



A unit-constructed machine which enables tooling for wide variety of long and short components to be arranged quickly in any combination by means of slides and attachments.

Either hand or automatic cycle control

Swing over bed 12"

Admits between centres 29"

ALFRED

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LTD., COVENTRY - FACTORED DIVISION, RED LANE WORKS

AD.367

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ARCHDALE

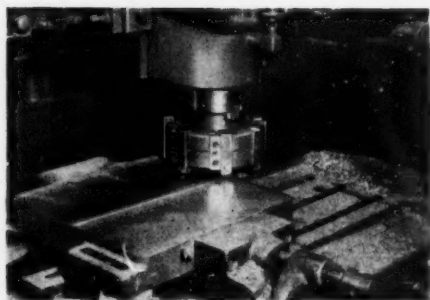
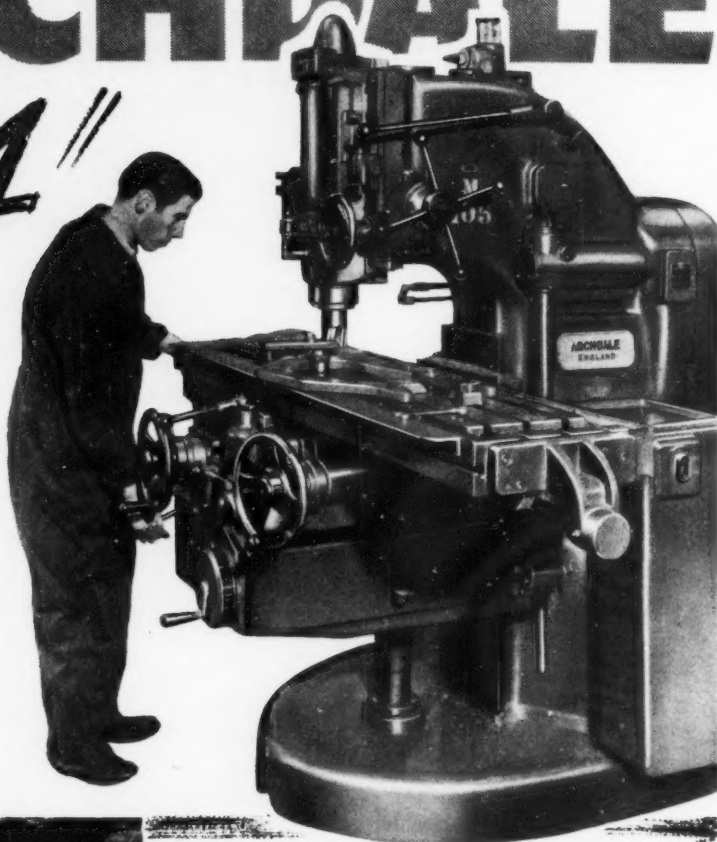
34"

VERTICAL

* versatile

* powerful

**CUTS COSTS
AT FORGROVE
MACHINERY CO., LTD.**



This massive, powerful and versatile machine makes light work of heavy duty milling on a variety of jobs at Forgrove Machinery Co. Ltd., Leeds.

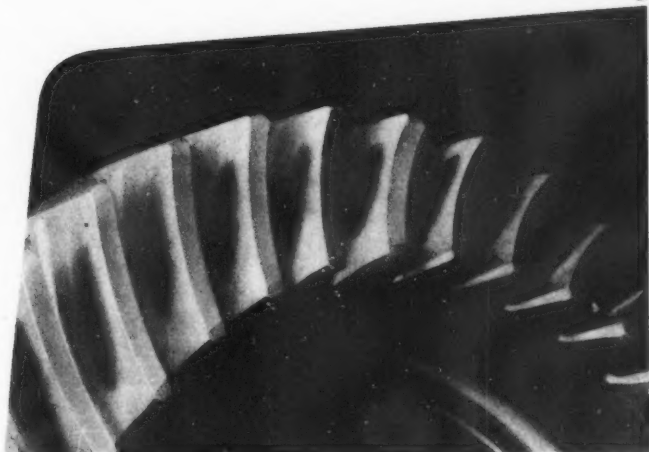
Table has reversible automatic feeds and quick power traverse in all three directions. Speeds and feeds changed from front of machine. Direct reading dials. Twelve speeds from 29/520 r.p.m. or alternatively 36/638 r.p.m. Twelve feeds, $\frac{3}{4}$ " to 20" per minute. Quick and fine hand adjustment to spindle. Table working surface 53" x 14 $\frac{1}{2}$ ".

JAMES ARCHDALE & CO. LTD.
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A Member of the Staveley Coal & Iron Co. Ltd. Group
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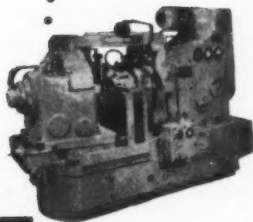
For more than 30 years

KLINGELBERG PALLOID SPIRAL BEVEL GEARS

(used in all industries, and especially in the manufacture of transport vehicles.)

The Klingelberg method is the only one producing spiral bevel gears by the use of hobs.

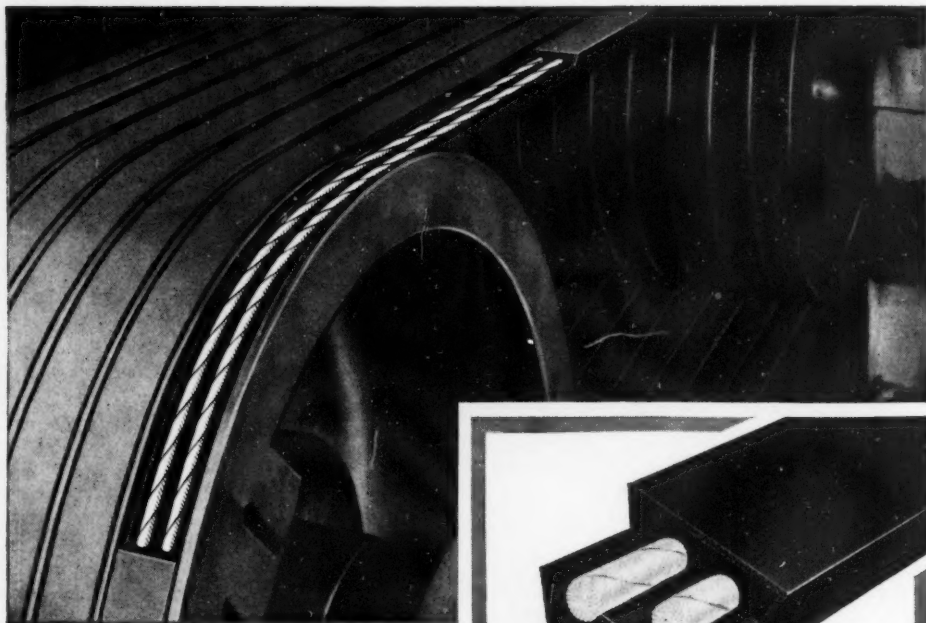
1. Simple maintenance of the very accurately ground hobs, and therefore high and constant accuracy of the gears.
2. Quiet running of the gears even in the case of displacements due to crowning flanks and suitable area of contact.
3. Easy positioning of area of contact with normal hobs by machine setting only and therefore absolute repeatability.
4. Long life through sturdy teeth with even tooth thickness and efficient tooth root radius.
5. Simple calculation and setting of machines and therefore very economical for cutting individual gears and for mass production.
6. Spiral Bevel Gears for intersecting axis and offset axis can be cut on the same machine with the same standard hobs.



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GERMANY

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 HYTHE WORKS : THE HYTHE : STAINES : MIDDLESEX
 Phone: STAINES 5076 (3 lines) Grams: "SYTOOL, STAINES"



how a GROMMET V-BELT works

A BTR High Test Grommet V-belt drives heavier loads with a higher safety factor because it's stronger; transmits more power for electricity consumed because it's more flexible; lasts longer because it's more durable, size for size, than any other V-belt. 'Grommetise' your drives with BTR High Test Grommet V-belts, especially where conditions are punishing—the more difficult the drive the more outstanding you'll find BTR High Test Grommet V-belt performance.

- A grommet (a cord loop built by winding high-tensile rayon cord upon itself in an endless spiral) is essentially strong and flexible.
- Grommet spiral construction ensures that all the windings share the load and stresses equally.
- Two identical matched grommets symmetrically positioned in the belt share the load equally.
- The grommets are on the neutral axis of the belt and largely unaffected by flexing stresses as the belt travels round the pulleys.
- Grommet construction makes room for extra rubber to absorb shock loads and protect the grommets from unfavourable conditions.



**ENGINEERS
IN RUBBER**

BTR HIGH TEST GROMMET V-BELTS

Patented in Britain by BTR Patent No. 567406

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**SWING THIS WAY
FOR EFFECTIVE
POWER CONTROL
ON THAT
DRIVE**

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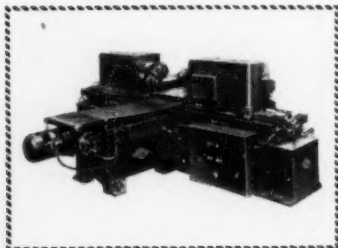
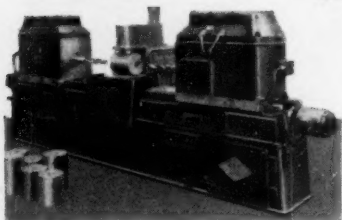
Industrial Electric Motor Control Gear Makers

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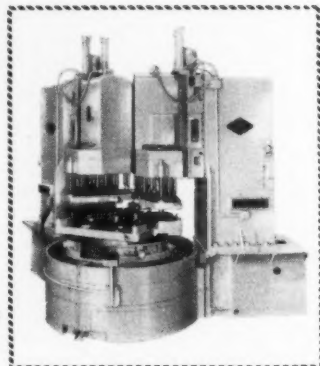
**POWER
DRIVE
CONTROL**

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DOUBLE-ENDED BILLET DRILLING MACHINE embodying two BROOKE U.H.3 Unit Heads.



DUPLEX MILLING MACHINE fitted with travelling table and U.H.3 Unit Heads. Air operated Quill retraction.



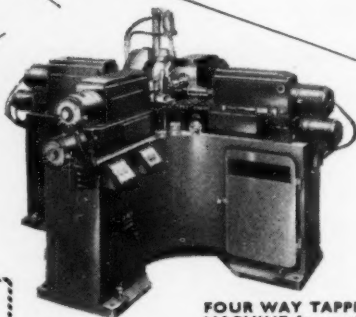
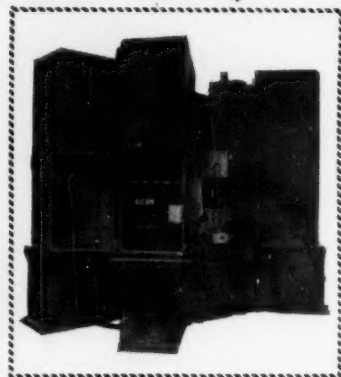
ROTARY INDEXING MACHINE for multi-drilling and tapping with two vertically mounted BROOKE U.H.3 Unit Heads.

A.M.T.

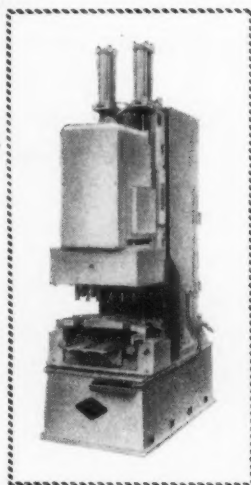
**designed
and built!**

FROM STANDARD UNIT PARTS

ROTARY INDEXING MACHINES for multi-drilling, tapping, facing and boring operations.



FOUR WAY TAPPING MACHINE for cutting four threads simultaneously.



VERTICAL MULTI-DRILLING MACHINE fitted with BROOKE U.H.4 Unit Head.

These are examples of A.M.T. Machines recently supplied. Similar set-ups for any number and type of operation can be designed and built from Standard Parts equipment. Enquiries are invited and our Design Engineers are available at any time to discuss your own production problems.

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Telephone: Selly Oak 1128/9/20

Telegrams: "Amtold, B'ham"

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Over 250 NEW MACHINE TOOLS UNDER POWER

for your inspection

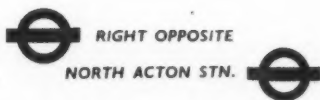
Here in London is a new permanent exhibition of British and Continental machine tools—where you can inspect and compare toolroom, production and special purpose plant at your leisure.

One of Britain's finest displays—every item is 'Elgar-Approved', your guarantee of confidence, in purchase and service.

We invite you to come and see us.



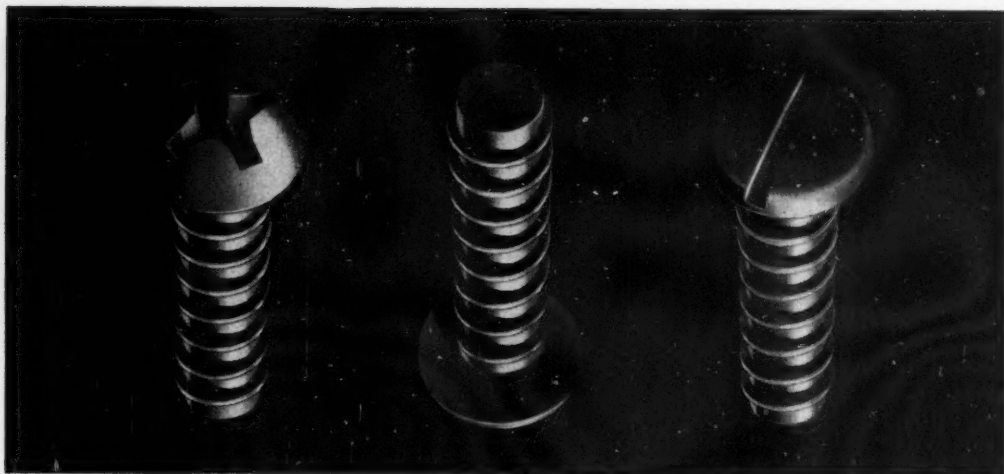
* 40,000 SQ. FT.
OF BRITISH AND
CONTINENTAL PLANT!



ELGAR MACHINE TOOL COMPANY LIMITED

172-178 VICTORIA ROAD · ACTON · LONDON W3 · Telephone ACORN 5555
Midlands Showroom: 1075, Kingsbury Road, Birmingham, 24

Important announcement to users of Simmonds Spire Speed Nuts



Spire Speed Screws (J type)

with Phillips Recess or Slotted Heads,
specially designed for use with Simmonds Spire Speed Nuts,
are now available from

SIMMONDS AEROCESSORIES LTD

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AND

GUEST KEEN & NETTLEFOLDS (Midlands) LTD

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CRC 508

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ALL on one machine, in one setting and with fully automatic operation for Batch and Mass Production without expensive single - purpose machines.

STELLAMATIC RB2A TURRET HEAD DRILLING MACHINE

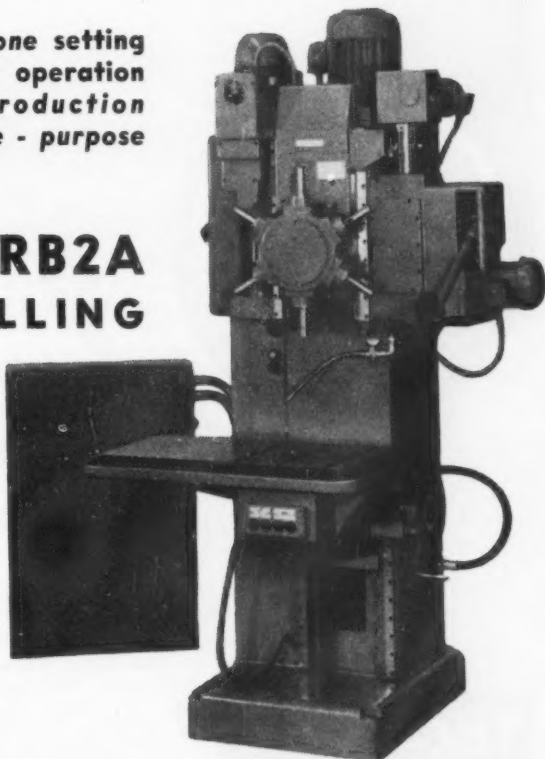
**—WITH CONTINUOUS
AUTOMATIC WORKING
CYCLE TO THE TURRET**

CAPACITY

Max. capacity in steel $\frac{1}{2}$ in. dia.	Spindle speeds (Infinitely variable for each spindle)
Morse taper ... No. 2	35—1,050 r.p.m.
Max. drilling depth ... 8 in.	or
Throat depth ... 8 in.	50—1,500 r.p.m.
Working surface of table ... 31 in. by 16 in.	or
	100—3,000 r.p.m.

Also supplied with hand-operated or mechanical feed.

★ Ask for a demonstration in our showroom



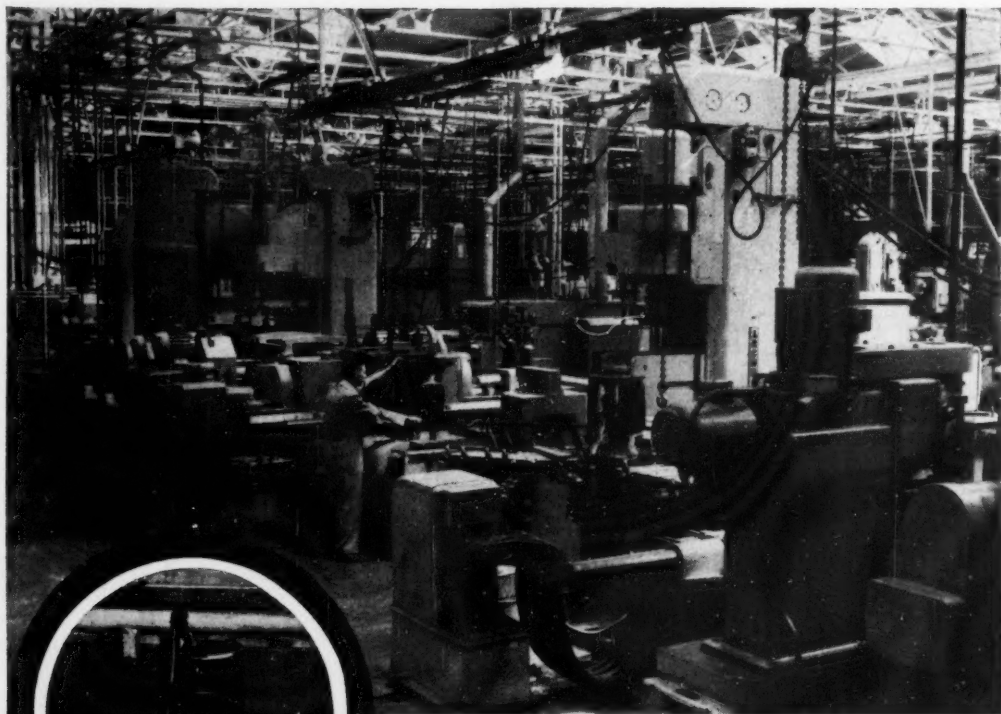
EARLY DELIVERY ON ALL MODELS

SOAG MACHINE TOOLS LTD. LONDON

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PHONE: RELIANCE 7201 • GRAMS: SOTOOLSAG, LONDON, S.E.11

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The 'Bijur' system fitted to an Archdale Transfer machine at the Standard Motor Company's Banner Lane Factory.

STANDARD
MOTOR COMPANY LIMITED

AUTOMATION

uses Tecalemit Lubrication

At the Standard Motor Company's Banner Lane factory in Coventry, the "Tecalemit-Bijur" Lubrication System is fitted to the three Archdale Multi-Station Transfer machines. These machines are used for machining the transmission housings for 100,000 Massey-Ferguson tractors each year.

Three "Tecalemit-Bijur" Lubricating Pumps are fitted to each machine, providing a measured quantity of oil for 170 lubrication points, at correct intervals, through calibrated metering valves. The "Tecalemit-Bijur" System, protects every bearing surface of the machine with a film of clean oil. Tecalemit lubrication increases production time by doing away with oiling shut-downs, and by prolonging the life and precision of the machines. There's no oil wastage and maintenance costs are considerably cut.

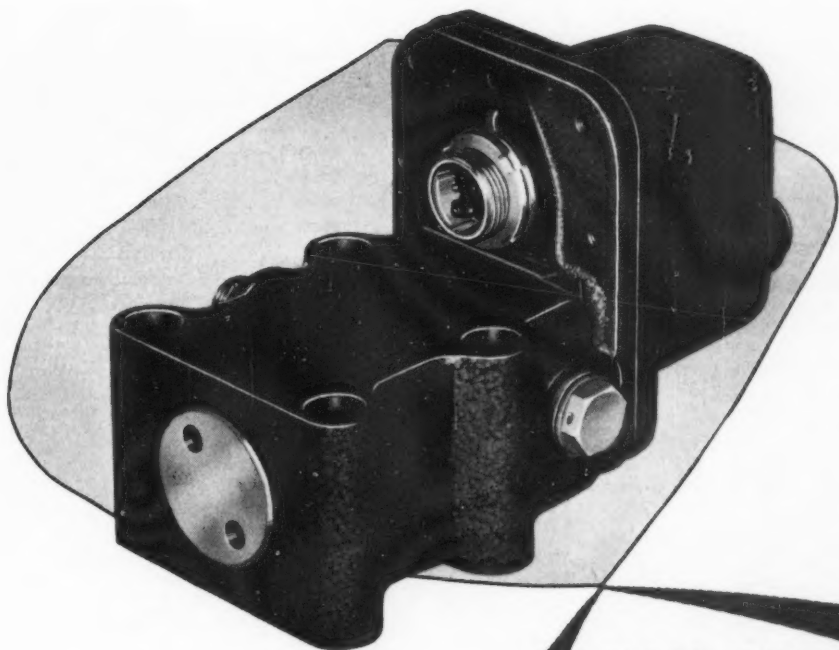
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The Authority on Lubrication

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Sperry Electro-Hydraulic Servo Valve

This Sperry Servo Valve is intended for any type of industrial electro-hydraulic servo system requiring accurate control. It is suitable for operating temperatures of -20° to 100°C .

RUGGED CONSTRUCTION Of rugged construction, the Sperry Electro-Hydraulic Servo Valve is designed for pad-mounting for general convenience of assembly and servicing.

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The connections from it terminate at a Mk. 4 miniature 3-way fixed plug or if preferred, a covered screw terminal block.

EXTERNAL SETTING Adjustment, operating on the pilot-valve linkage, is incorporated to enable the hydraulic neutral to be set externally. When the transducer cover is removed, this adjustment remains unaltered.

RAPID RESPONSE Excellent frequency response characteristics.

VARIETY OF MODELS The valve is produced in 2.5, 5, and 10 g.p.m. models, the number of orifices for the main valve being varied for each model.

For further details of the Sperry Electro-Hydraulic Servo Valve, write for illustrated brochure

Principal characteristics of
5 g.p.m. model:
Max. Supply Pressure: 3,000 p.s.i.
Max. Flow: 5 g.p.m.
Max. Power Input: 6 watts
Max. Power Output: 4 h.p.
Size: $7\frac{1}{2}$ " long \times $3\frac{1}{2}$ " wide \times $4\frac{1}{2}$ " high
Weight: 6 $\frac{1}{2}$ lb.

SPERRY Servo-Control Components for Industry

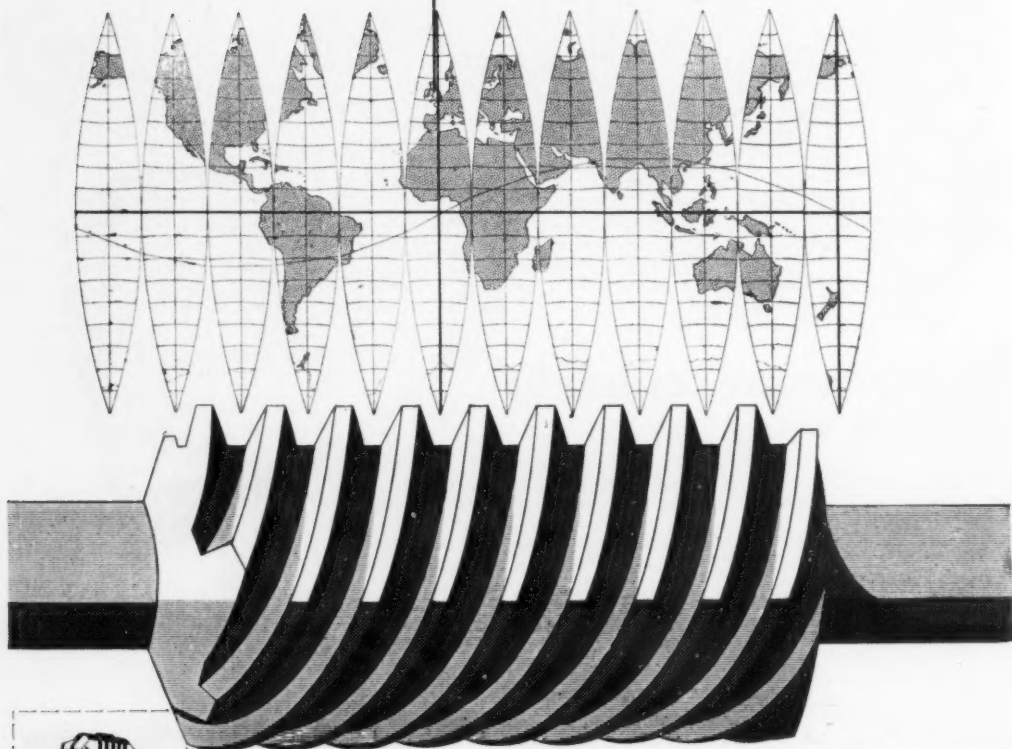
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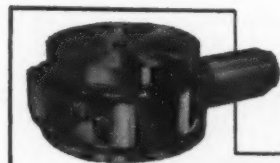
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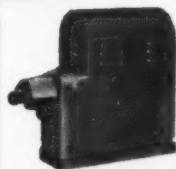
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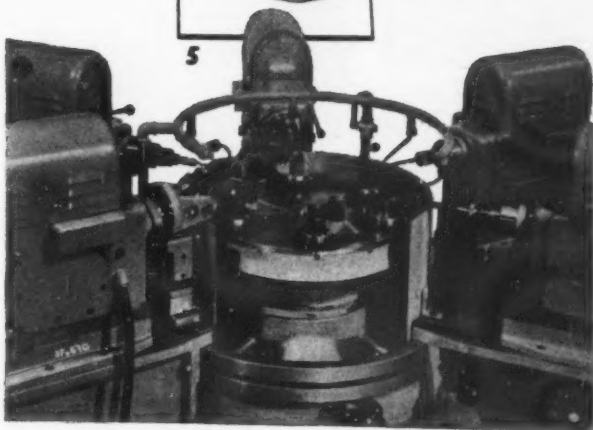


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General view special purpose machine built from horizontal units and index table.

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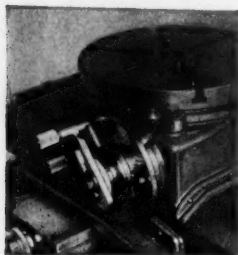
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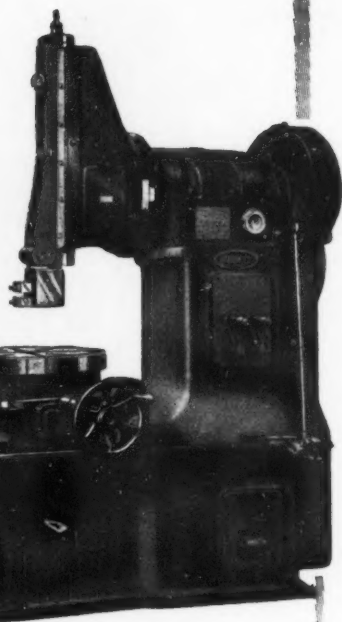
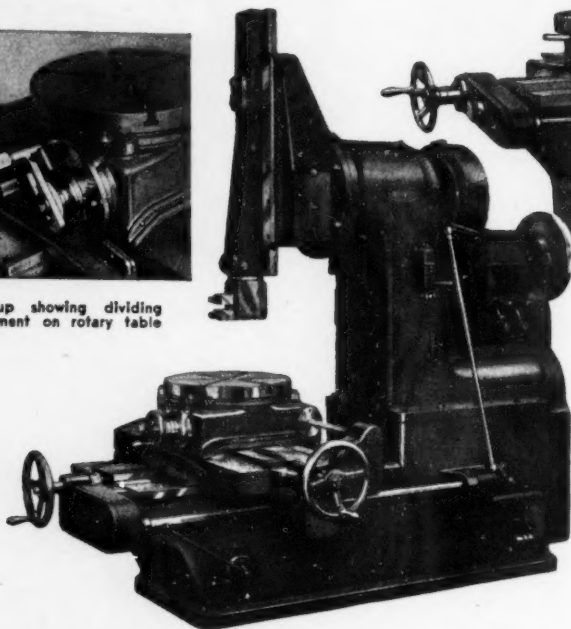
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The BURDETT range for the toolroom includes high speed, versatile and accurate machines with 8", 10", 12" and 14" strokes. Tooling is uncomplicated and operation, simple. The BURDETT design features strength and rigidity, together with ample bearing surfaces, to withstand deflection under heavy loads, and preserve accuracy under the most arduous conditions of operation. The system of construction is such that all working parts are easily accessible for inspection and maintenance. The swivelling head can be inclined 10° either side of the vertical and the rotary table, which indexes 12 positions, has safety interlock of hand and power feeds. A dividing attachment can be fitted in a matter of a few minutes. The 10" model in this range is illustrated below.



Close-up showing dividing attachment on rotary table



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The machine above is available in two sizes, with 6½" and 8½" strokes. It possesses many features of the toolroom model described above but is intended primarily to accommodate the many jobs which do not require such extreme accuracy and versatility.

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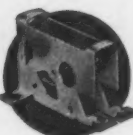
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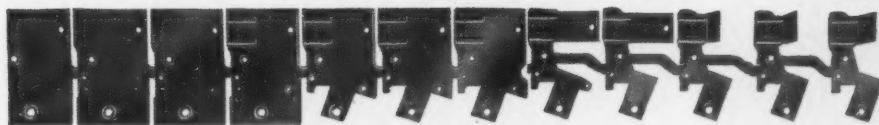
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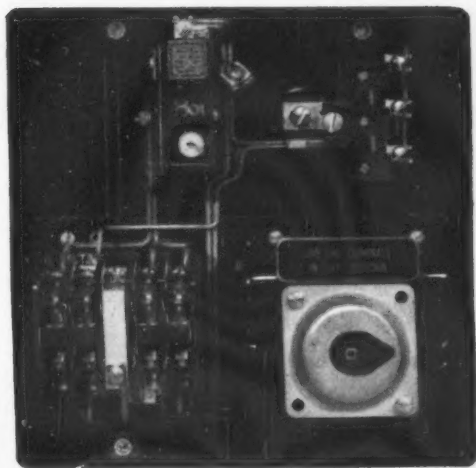
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Guaranteed life control gear

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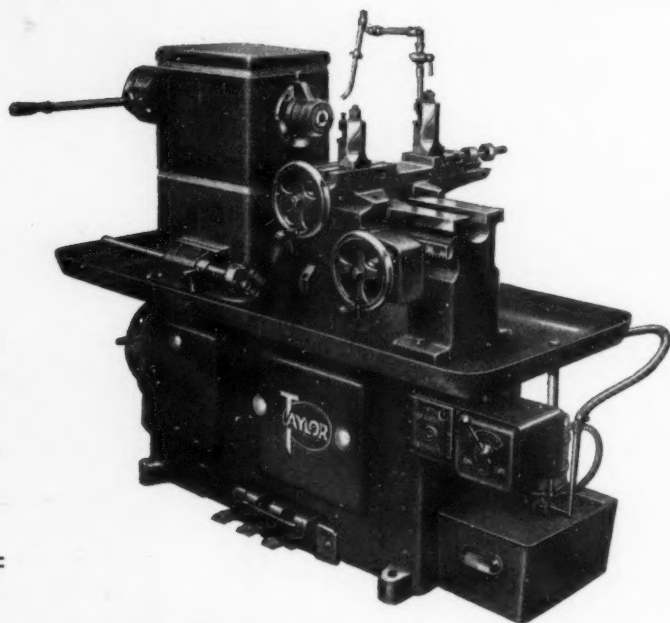
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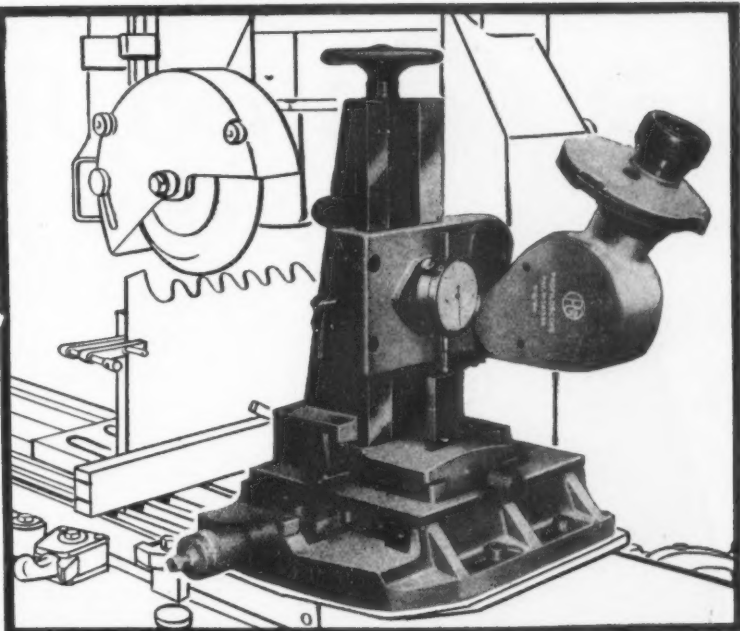
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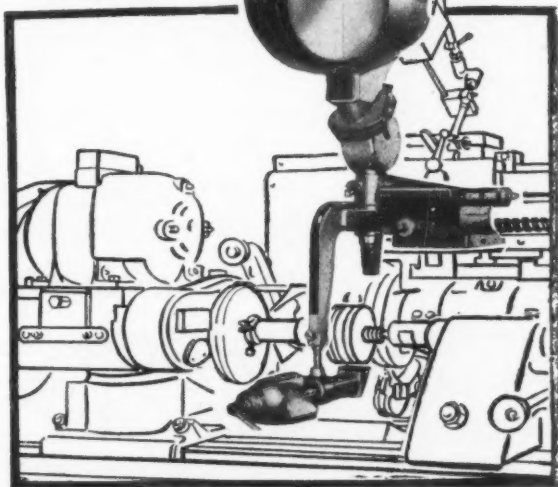
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control
of form
grinding
is assured
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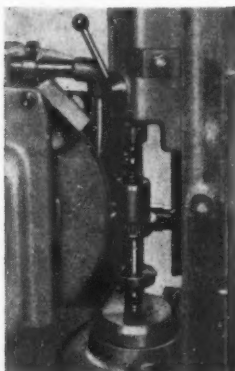
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"Heligrind" fine pitch spur gear grinder, grinds from solid blanks or rough cut gears to B.S.I. Class A ground gear limits, in a fraction of time previously required. Automatic dressing of wheel—fast continuous grinding action—any form such as serrations, ratchets, etc., ground. Proved in practice the most accurate method of producing fine pitch gears. Maximum dia. $4\frac{1}{2}$ in. D.P. 14 to D.P. 120.



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HIGH PRODUCTION
SPUR GEAR GRINDER

DESIGNED AND MANUFACTURED BY

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CAMSHAFT GEARS

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16 D.P., 20° P.A., 32 teeth.

Width of TEETH: $\frac{1}{4}$ in.

Material: EN 33 C/MN.P.

TEETH FINISH: Ground after

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(0.015 in. allowance on each flank).

GRINDING TIME: 4 minutes

Batch of 93 ground in 11 hours

inclusive of setting.

Accuracy: B.S.I. Class A.I.

Saving in cost on original

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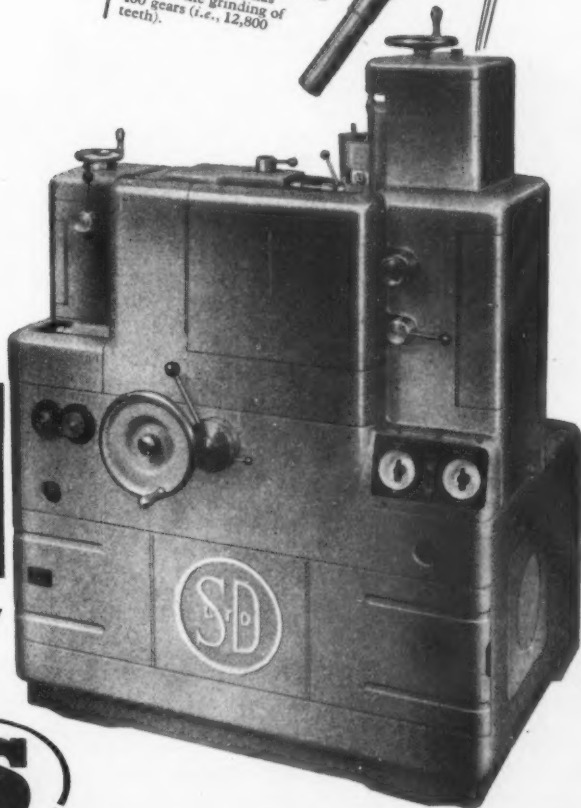
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between regrinds, has

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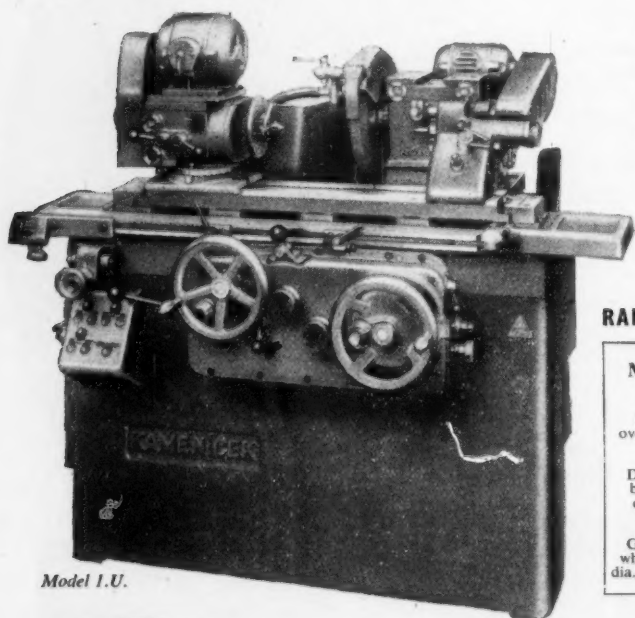
400 gears (i.e., 12,800

teeth).



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UNIVERSAL GRINDING MACHINES



Model 1.U.

Heavy duty precision built, for cylindrical (external and internal) as well as for taper and face grinding. Hydraulic table traverse; hydraulic infeed; swivelling wheel head; work-head with six spindle speeds swivels 90 degs. for taper and face grinding.

RANGE INCLUDES:

Models	1.U.	2.U.	5.U.	7.U.
Swing over table	10"	11.6"	15½"	26"
Distance between centres	15½"	20", 30", 40"	40", 59", 79"	98½", 118"
Grinding wheel size: dia./face/hole	11.8" x 1" x 3"	13.8" x 1.57" x 5"	17.7" x 2" x 8"	20" x 3" x 8"



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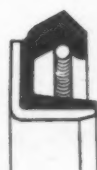
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The standard rotary shaft seal. Gives perfect sealing at high speeds and for long periods, with minimum frictional loss.

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A rotary shaft seal used to separate two different fluids.

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A special section ring which cannot twist. Superior to the O-ring for low and medium pressure non-static applications.

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A compact automatic seal for reciprocating and static applications over a wide range of temperatures and pressures. All British Standard sizes in stock.

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A hydraulic and pneumatic seal used chiefly on reciprocating pistons or as a valve stem packing. Normally fitted in a groove.

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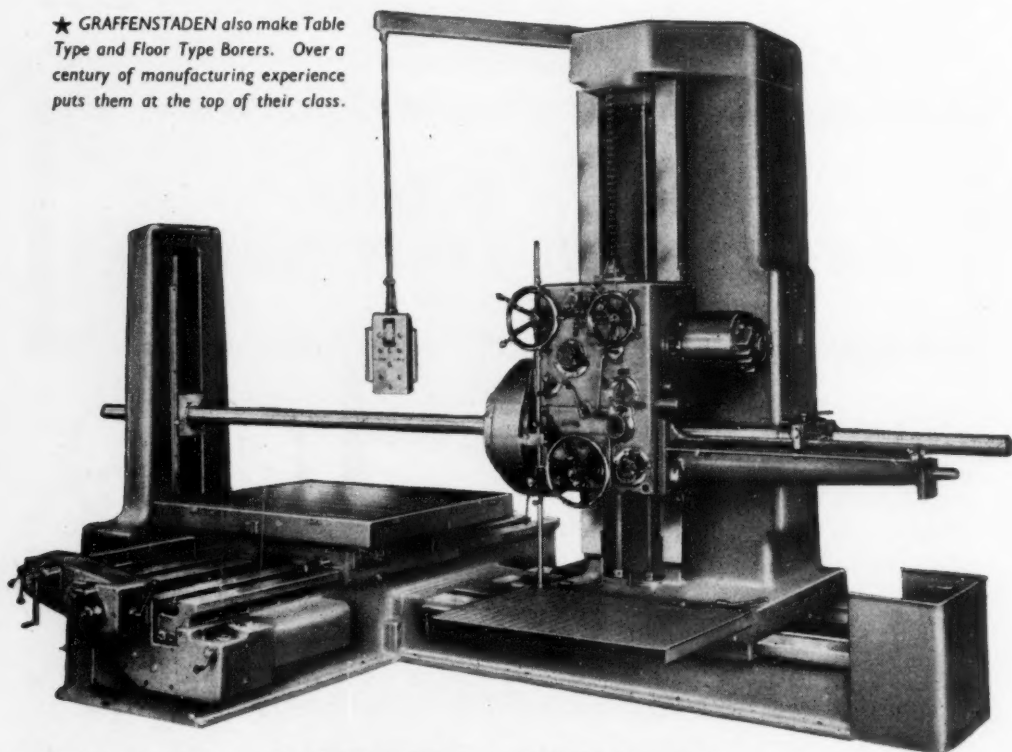
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ACCURACY

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FOR GREATER

Moving Column can be brought close to the job · Table fully supported in all positions

ALL GRAFFENSTADEN BORERS HAVE : 1. Hardened and ground gears. 2. Rapid traverse to all movements including rotation of table. 3. Spindle of high tensile nitrided steel. 4. Faceplate rotating independently of the spindle, so that both can operate simultaneously at the same or different speeds. 5. Outer support bearing moving up and down automatically, simultaneously with the spindle.

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Max. height under cross rail - 51in.
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18 rates of feed.
Rapid traverses to all movements.
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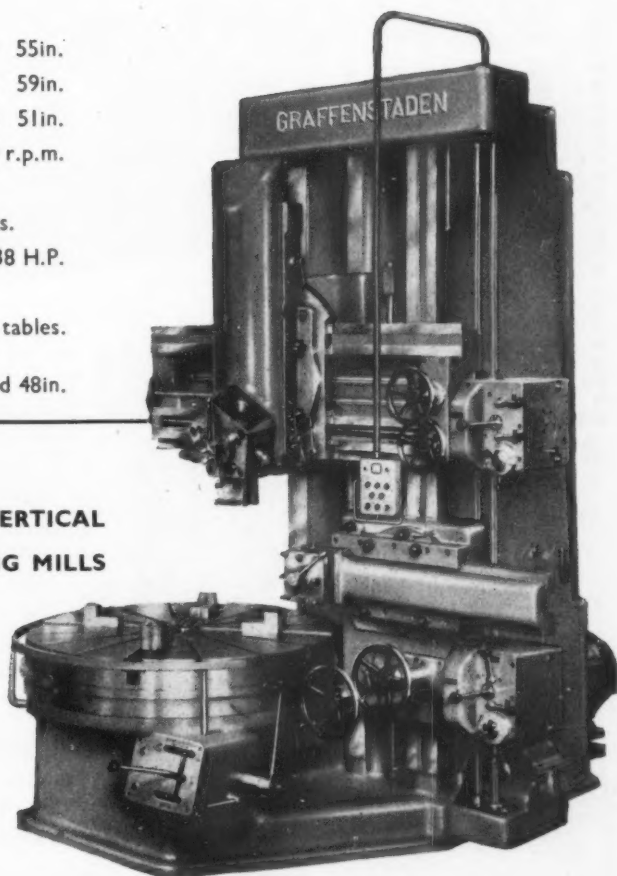
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★ Users will confirm that
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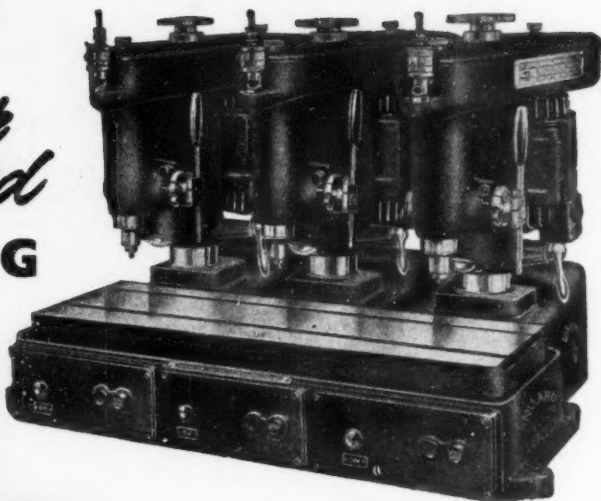
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*for Super
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DRILLING

UP TO 18,000 R.P.M.
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MODEL 9 FX



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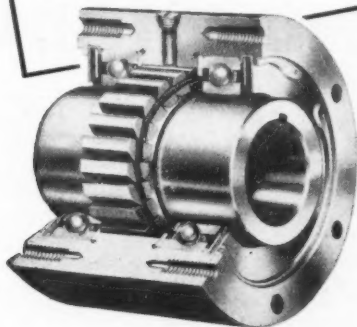
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COUPLINGS
up to 20 h.p.



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- for continuous freewheeling with low drag
- for fast and accurate indexing
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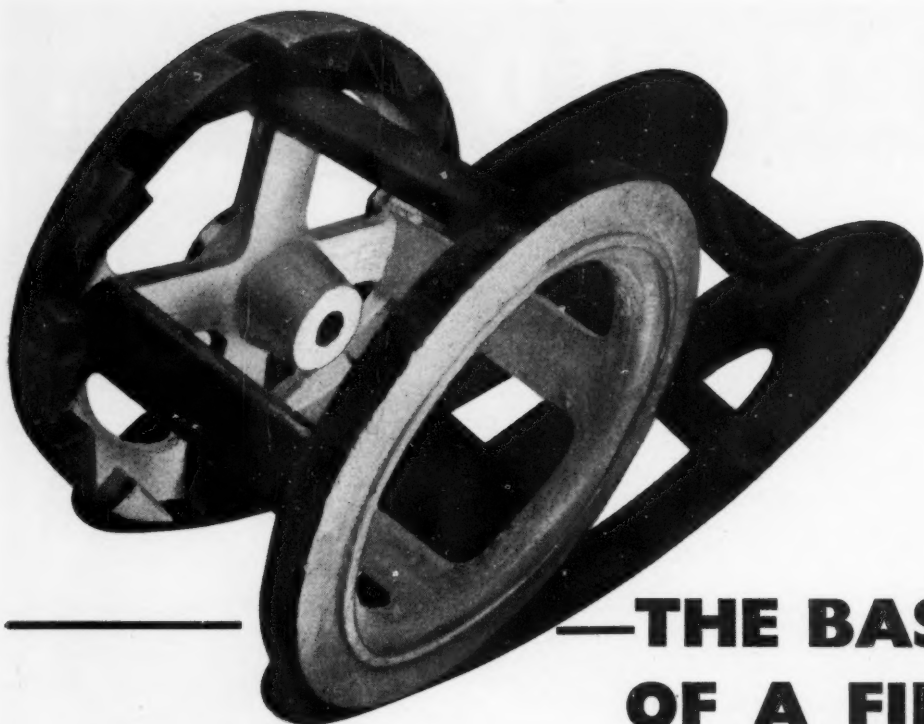
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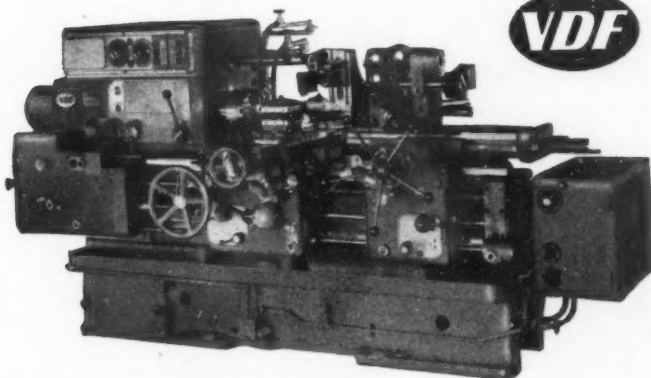
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4 MODELS

each with hardened and ground bedways and rapid traverse in all directions.

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max. diameter bar $1\frac{31}{32}$ "
swing over bed $17\frac{3}{4}$ "
motor h.p. 10
- * **RS63**
max. diameter bar $2\frac{31}{64}$ "
swing over bed $17\frac{3}{4}$ "
motor h.p. 13
- * **RS80**
max. diameter bar $3\frac{5}{16}$ "
swing over bed $22\frac{1}{16}$ "
motor h.p. 19
- * **RS100**
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swing over bed $22\frac{1}{16}$ "
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SYKES

Phone: STAINES 5076 (3 lines)

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MACHINE TOOL CO. LTD

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(pass it on!)

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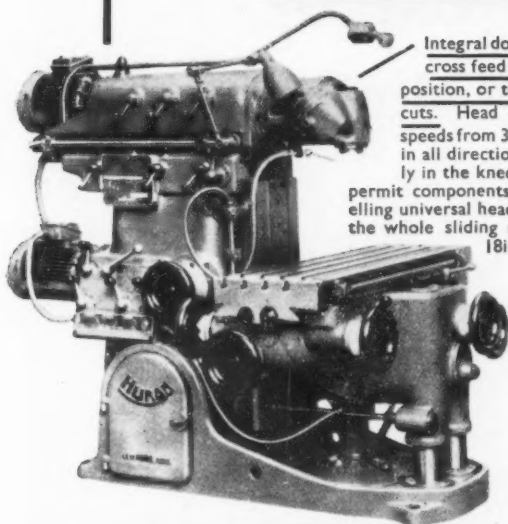
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SLIDING RAM
GIVES 27 $\frac{1}{2}$ in.
AUTO CROSS
FEED

HEAVY DUTY MILLING

ANGULAR COMPOUND HORIZONTAL VERTICAL

HURON SUPER UNIVERSAL MILLERS



Integral double swivelling universal head provided with 27 $\frac{1}{2}$ in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Head can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m. 27 feeds from $\frac{1}{16}$ in. to 30in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel. Double guides of knee permit components in excess of 1 $\frac{1}{2}$ tons to be machined. The double swivelling universal head requires an opening of only 14in. to enter work pieces and the whole sliding ram with its 27 $\frac{1}{2}$ in automatic cross movement needs only 18in. clearance.

Type	Table	Automatic Feeds		
		Long	Cross	Vert.
KU4	56 $\frac{1}{2}$ in. x 15 $\frac{1}{2}$ in.	43 $\frac{1}{2}$ in.	27 $\frac{1}{2}$ in.	19 $\frac{1}{2}$ in.
KU5	64 $\frac{1}{2}$ in. x 15 $\frac{1}{2}$ in.	51 $\frac{1}{2}$ in.	27 $\frac{1}{2}$ in.	19 $\frac{1}{2}$ in.
KU6	78 $\frac{1}{2}$ in. x 16 $\frac{1}{2}$ in.	59in.	27 $\frac{1}{2}$ in.	19 $\frac{1}{2}$ in.
L7	157in. x 39in.	118in.	27 $\frac{1}{2}$ in.	39 $\frac{1}{2}$ in.

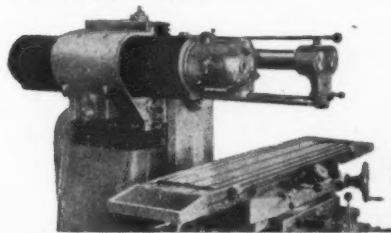
Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting.

The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table, and the sliding ram moves vertically and horizontally.

DUFOUR UNIVERSAL MILLERS

Table surface 43 $\frac{1}{2}$ in. by 9 $\frac{1}{2}$ in. or 47 $\frac{1}{2}$ in. by 10 $\frac{1}{2}$ in. Auto long. feed, 26 $\frac{1}{2}$ in. or 30 $\frac{1}{2}$ in. Auto vert. feed, 15 $\frac{1}{2}$ in. or 18 $\frac{1}{2}$ in. Auto cross feed 9 $\frac{1}{2}$ in. Rapid traverse in all directions. No. 40 International taper for main spindle, universal head, and rotary table. Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Spindle speeds 21 to 1,600 r.p.m. Twin overarms. Separate motor for rapid traverses.

Dufour No. 54 Universal Miller. Table surface 62.99in. by 14.763in. Automatic long. feed: 39.37in.; vert. 20.275in.; cross: 14.173in. and automatic cross feed of universal head 25 $\frac{1}{2}$ in. Manual vert. feed: 4 $\frac{1}{2}$ in. 18 spindle speeds for universal head: 12 to 1,500 r.p.m. 36 spindle speeds for horizontal spindle 6 to 1,500 r.p.m. Can also be supplied as plain miller, with central detachable universal head, or with side universal head, without automatic feed.



Also **SCULFORT** Heavy Duty High Speed Lathes
We supply **EX-STOCK** and demonstrate **CLARE**
Chucks and Collets

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Manufactured from specially selected and heat treated high speed steel or carbon chrome steel.

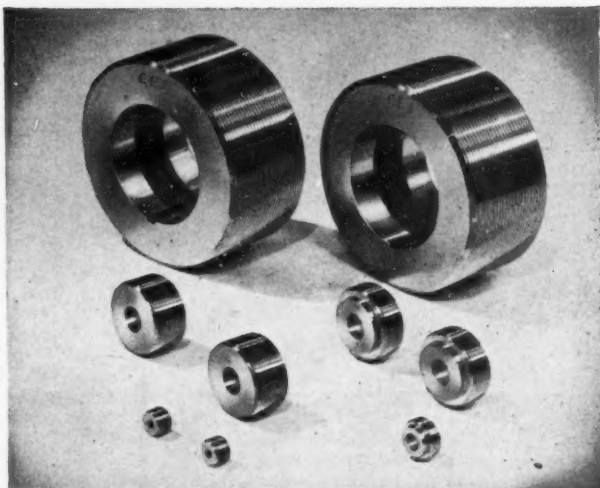
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etc.

All enquiries for dies to suit these and other machines will receive prompt attention.

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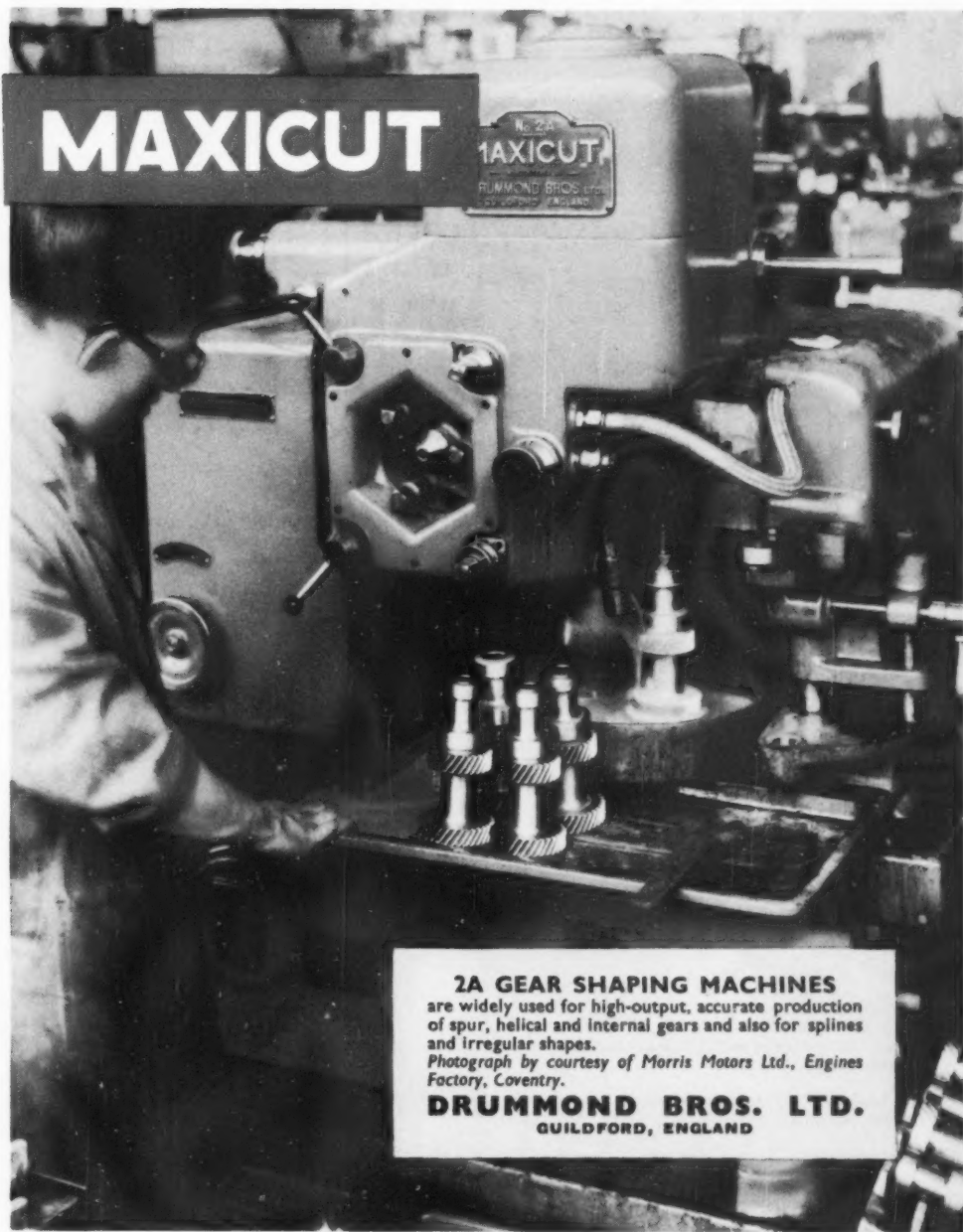
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are widely used for high-output, accurate production of spur, helical and internal gears and also for splines and irregular shapes.
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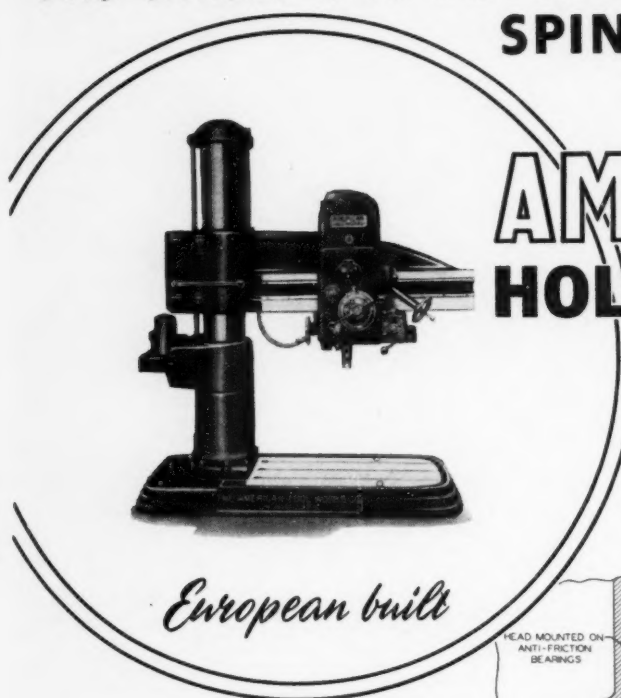
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The **AMERICAN HOLE WIZARD**



European built

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- Twelve speed head with built-in motor drive with motor mounted on head and directly coupled to initial driving shaft.
- Electric Column Clamp operated from head.
- Combined Elevating and Arm Clamping mechanism through single lever control.
- Electrical reverse for tapping.
- Six Geared Feeds.
- Three Optional ranges of 12 direct reading spindle speeds.
- Nitrided spindle and spindle sleeve—anti-friction mounted.
- Lo-Hung Spindle Drive.

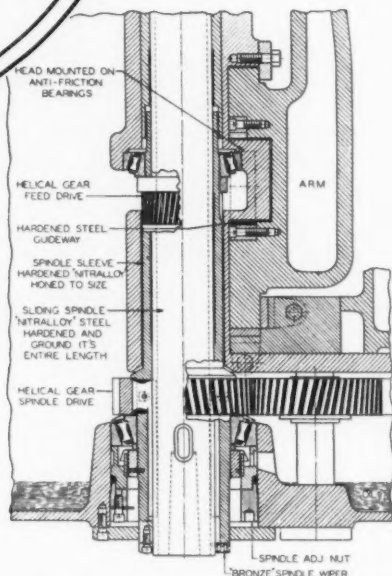


Diagram of spindle assembly.



Spindle unit showing integral feed rack, helical gear drive and adjustable Timken roller bearing mounting.

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- British Standard motors, frames B.56 and B.66 to B.S.2048, available.



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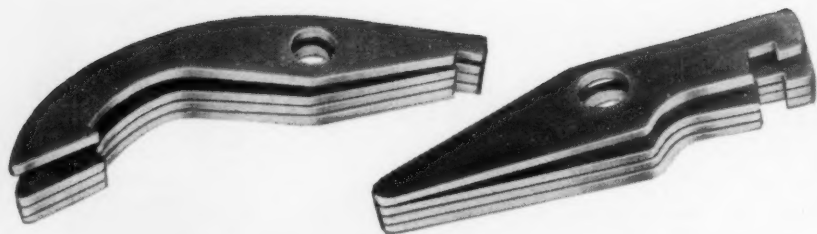
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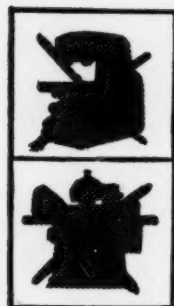
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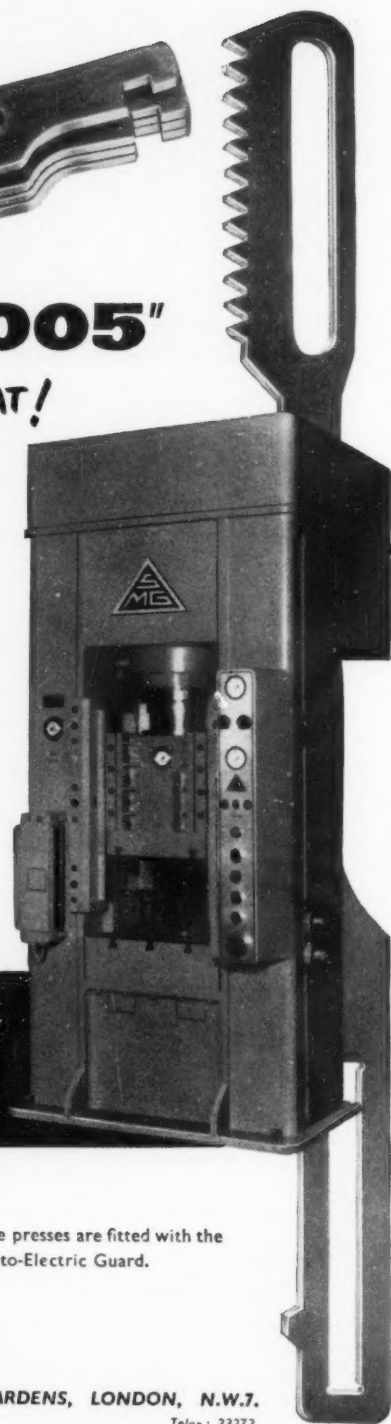
Blanked to 0.0005"

in ONE operation and PERFECTLY FLAT!



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The advertisement features two drill bits against a dark background. The bit on the left is labeled 'EX' and has a standard double-flute design. The bit on the right is labeled 'STOCK' and has a more complex, multi-fluted design. Above the bits is the Hardinge logo, which consists of the word 'Hardinge' in a stylized script font inside a circular emblem. Below the bits, the company name 'Hardinge Machine Tools Ltd.' is printed in a bold, sans-serif font. Underneath this, in smaller text, is '(ONE OF THE SHEEPBRIDGE ENGINEERING GROUP)'. At the bottom, the company's location 'Feltham - Middlesex' is listed, along with its telephone and telegram numbers.

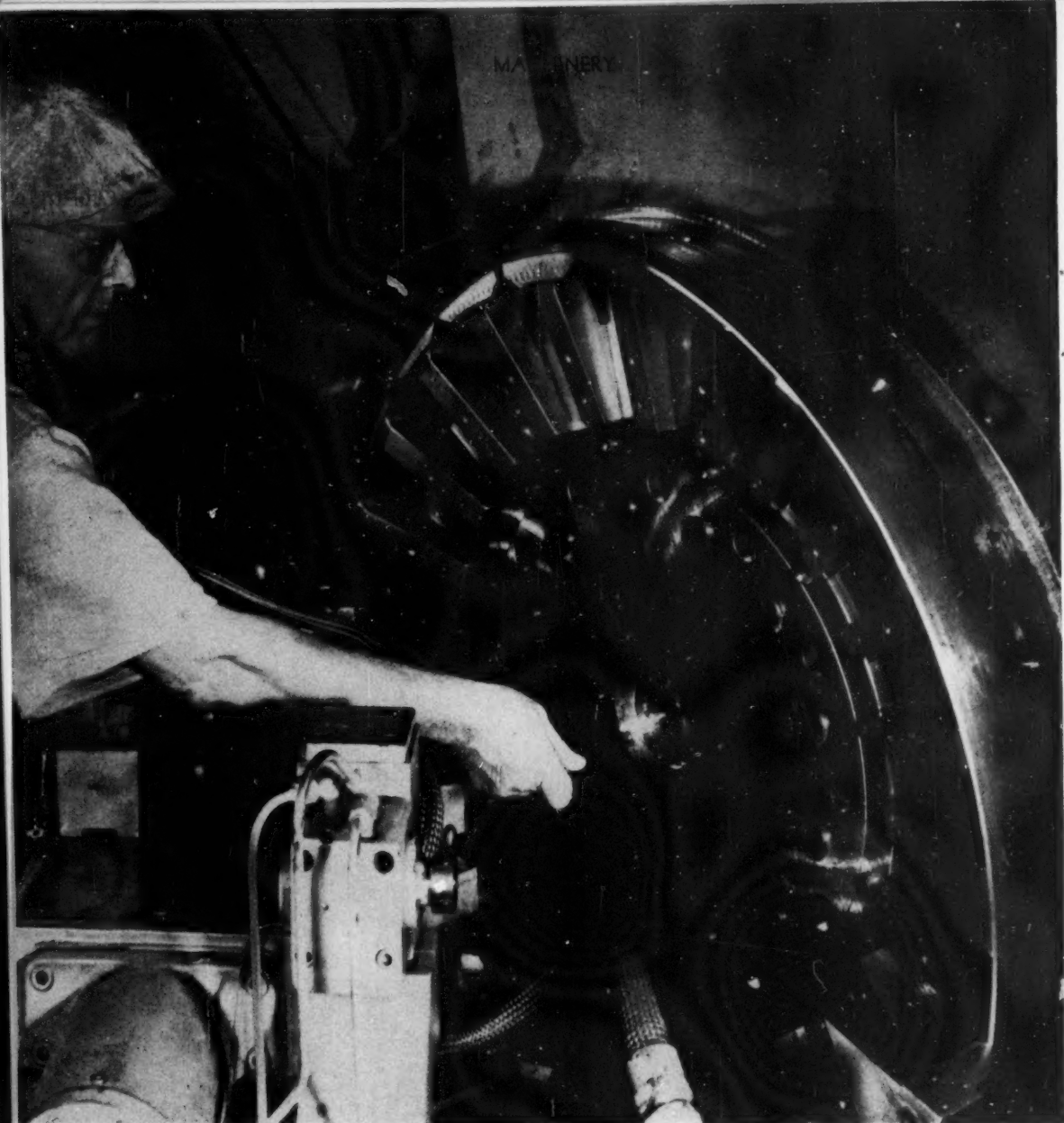
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LARGE AND THIN

The features of a Woodworth diaphragm chuck eliminate the locating problems on parts like the one shown.

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By completely filling the internal diameter of this part, the chucking action forces the part round. In this way uniform wall sections are obtained and accurate diameter and length dimensions can be machined.

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➤ Consistent repeated accuracy to .0001"/.0002".

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➤ Distortion totally eliminated.

➤ Pitch line chucking on gearing made easy.

➤ Determined pressure of grip constantly repeated.

➤ Send us your problem.

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CHUCKS

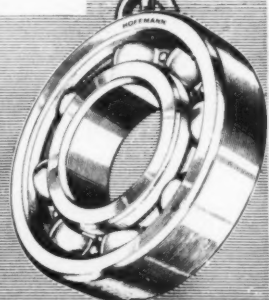
***Almost as easy
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Spindle bored 3 in.

Spindle speeds 24
(32 to 1000)

Motor 10/5 H.P.

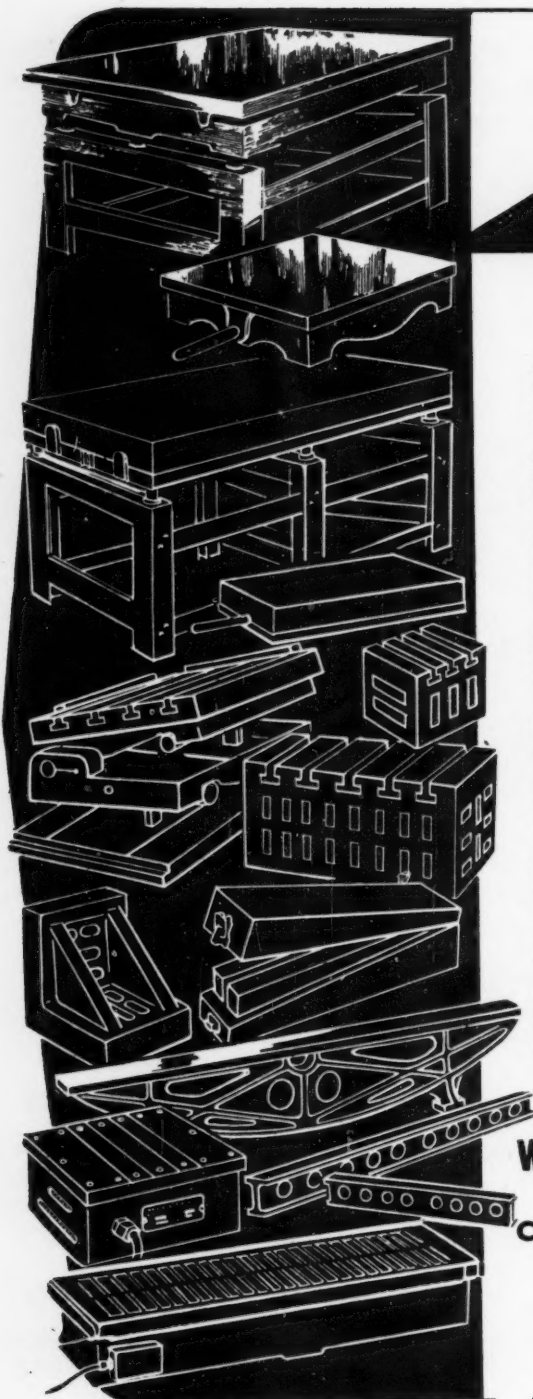
Complete machine with bed to
admit 36" between centres

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Increased lengths of bed at slight
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PRESENT

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T-MAX

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**THROW-AWAY
TOOL HOLDER**

- * Simple
- ** Sturdy
- *** Compact
- **** Efficient
- ***** Exclusive spring
lifted three step
chipbreaker

The new T-MAX provides an indexable and invertible insert, which is securely held and seated on a reversible carbide anvil, chamfered to ensure good tip seating even when the insert edges are built up. The inserts are available in a range of thicknesses and radii in precision ground or utility finishes.



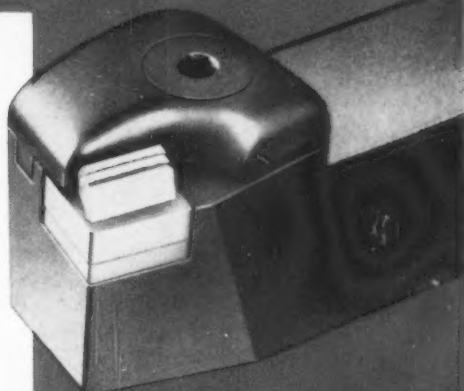
3 types as shown

2 sizes: 1 in. x 1 in.
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Right and Left hand

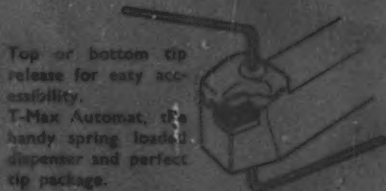
SEE THE T-MAX ON:
STAND 8 ROW J
PRODUCTION EXHIBITION
OLYMPIA (May 12th - 21st)

SANDVIK SWEDISH STEELS LIMITED
MANOR LANE • HALESOWEN • BIRMINGHAM

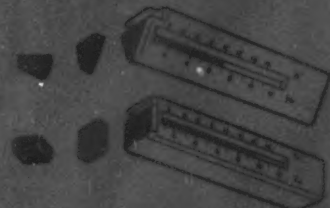
Telephone: Halesowen 2121 (7 lines)



Adjustable chipbreaker in Coromant carbide. Lifts automatically when insert is released for indexing or changing. No loose parts to fall out in awkward places.



Top or bottom tip release for easy accessibility. T-Max Automot, the handy spring loaded dispenser and perfect tip package.

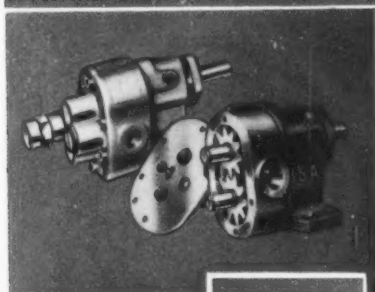
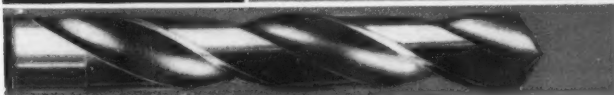
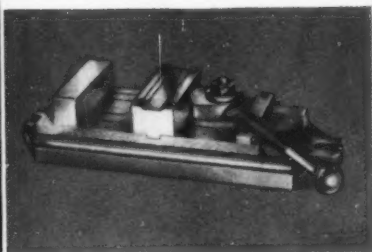
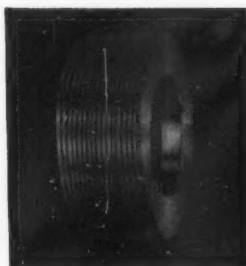


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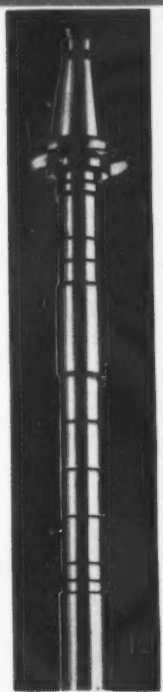
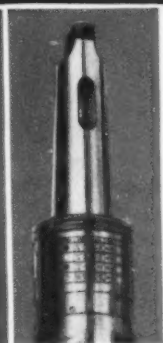
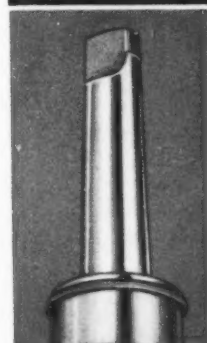
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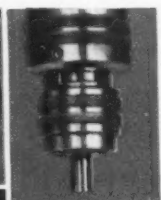
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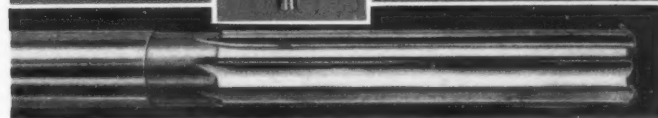
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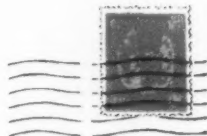
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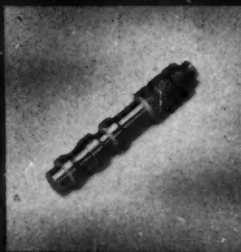
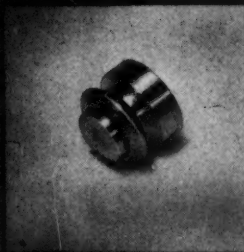
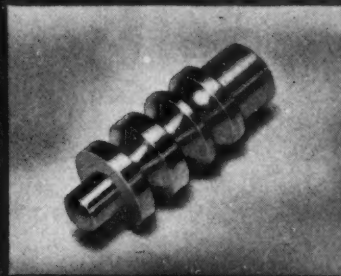
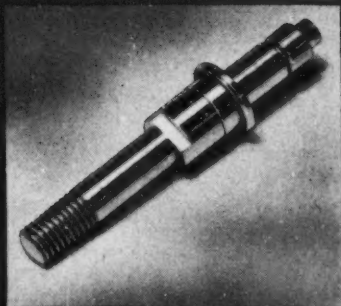


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SILVER STEEL



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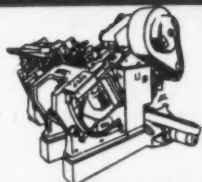
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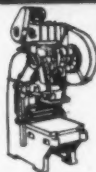
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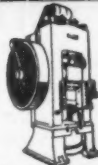
Telephone: DERBY 4001 (4 Lines)



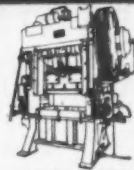
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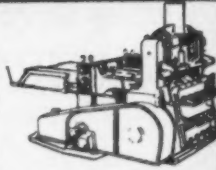
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We are always pleased to
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**GAUGE & TOOL EXHIBITION
OLYMPIA
MAY 12 - MAY 21
STAND No. 134**

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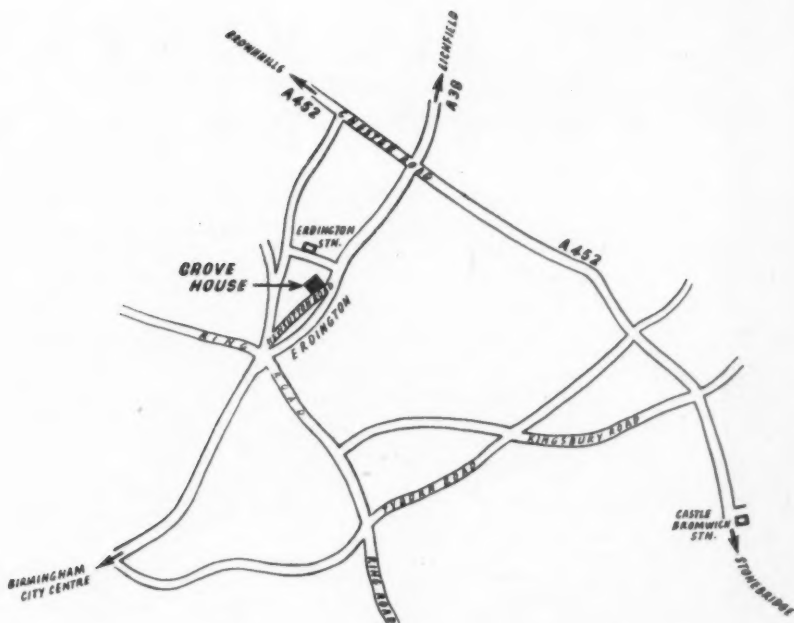
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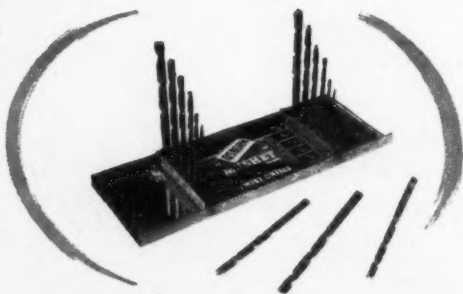
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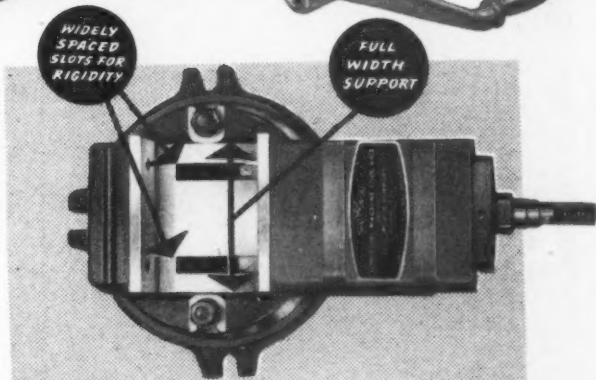
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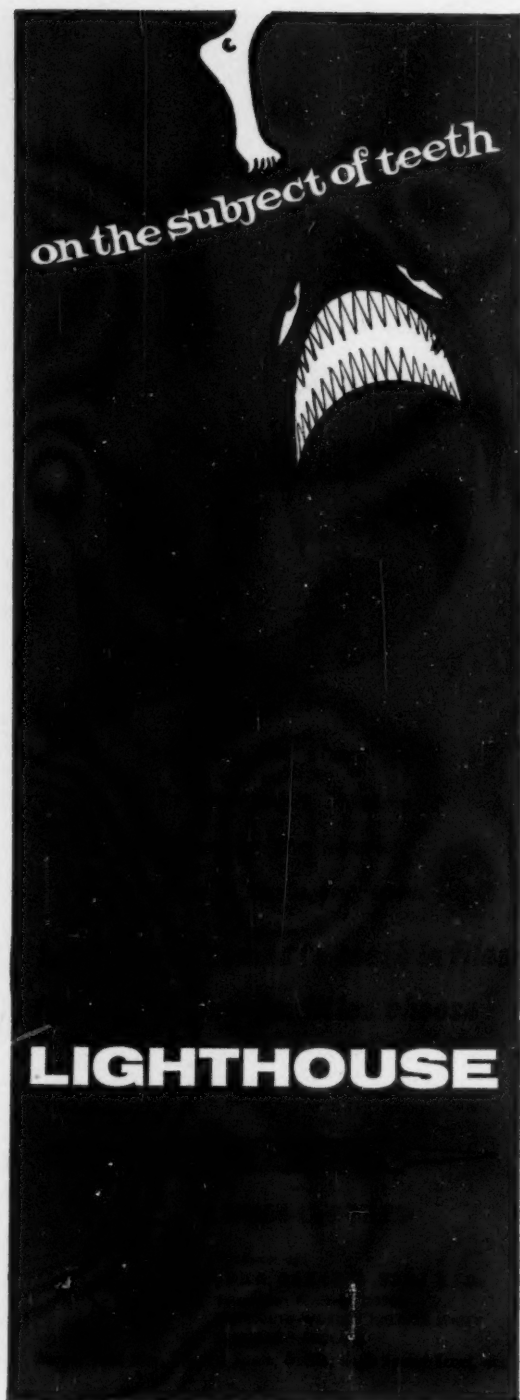
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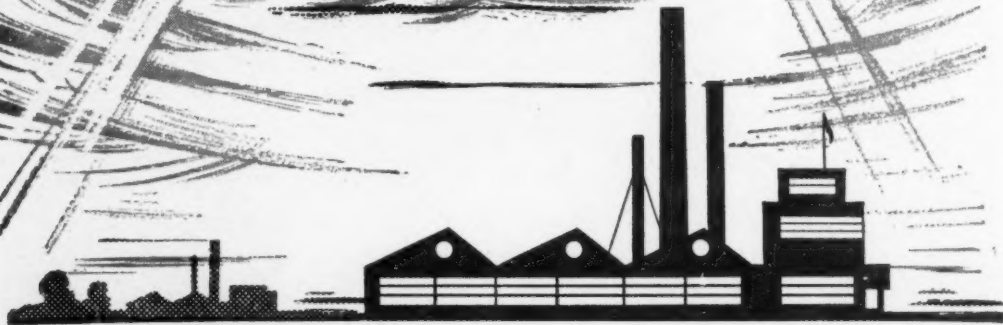
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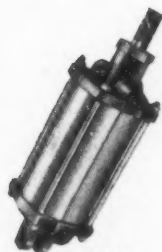
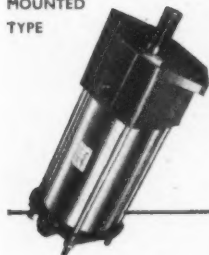


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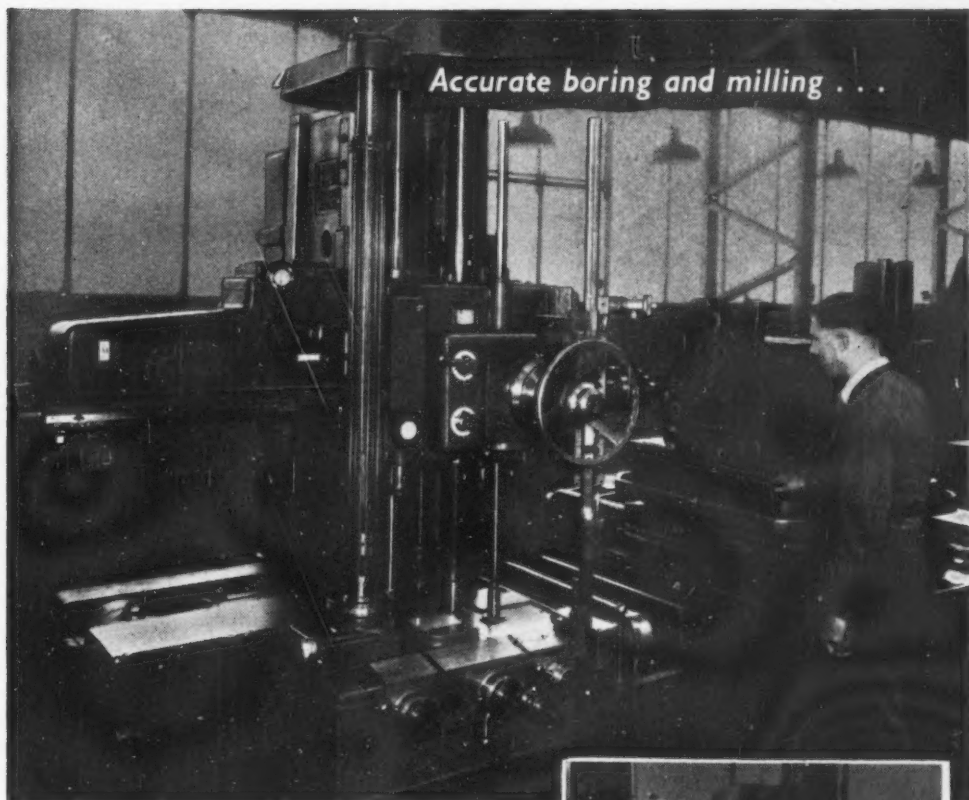
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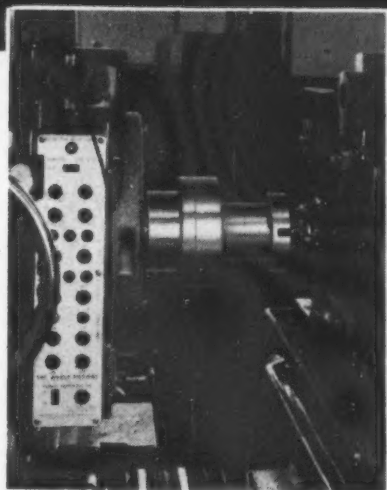
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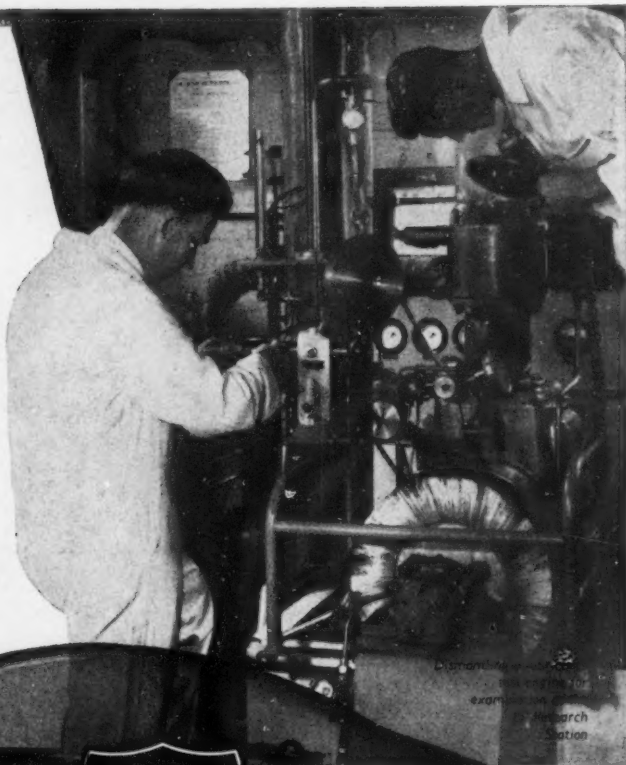
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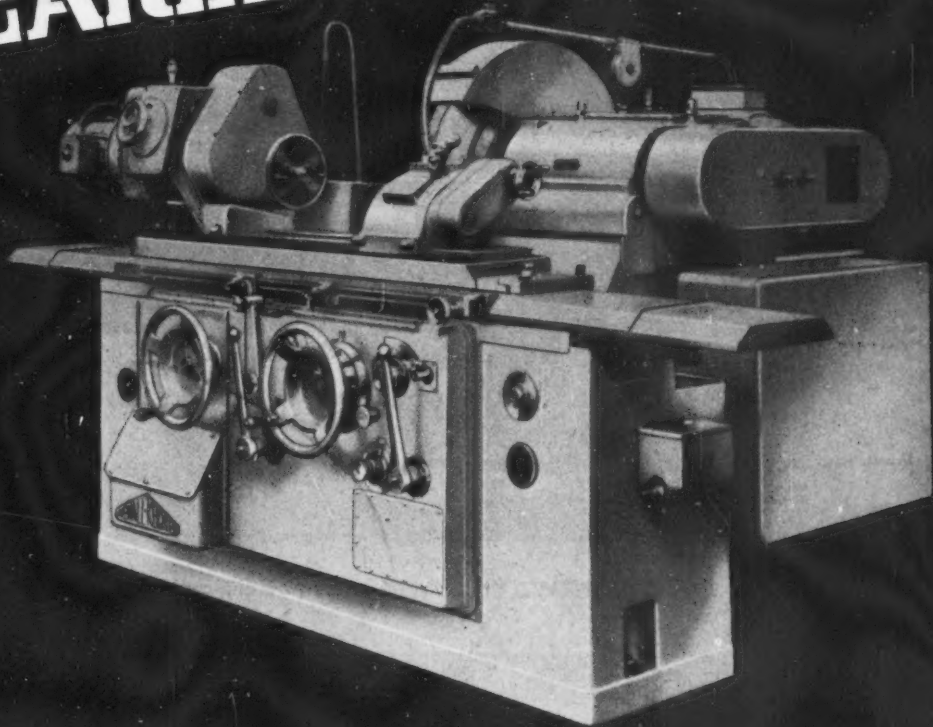
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Although primarily a plain grinder with a considerable reputation for output, accuracy and finish of components; a wider range of equipment provides facilities for grinding convex and concave radii, angle and shoulder work, special form and centre grinding. A self-contained internal grinding attachment supplied to order converts the basic machine into a precision semi-universal grinder.

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12' x 24"	12' x 36"
12' x 48"	12' x 60"

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**CYLINDRICAL
GRINDER**

Full details on request to

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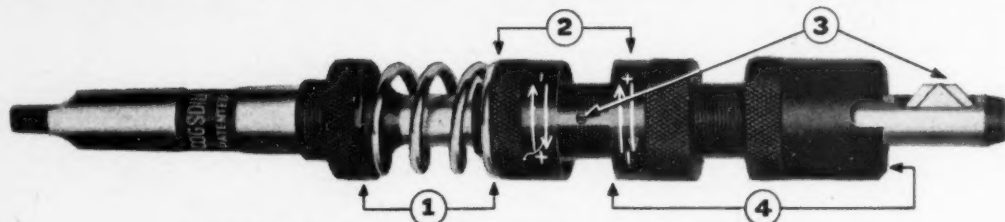
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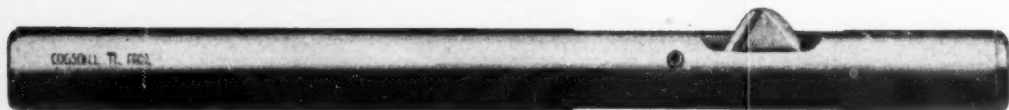
**BURRAMATIC
BURRAWAY
BEARING-IZING**

TOOLS

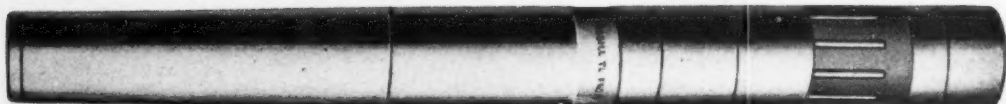
will help you **SPEED-UP** production and **REDUCE** costs



BURRAMATIC . . . a new approach to removing burrs



BURRAWAY . . . split-second efficiency



BEARING-IZING . . . delivers 200,000 blows per minute

BURRAMATIC

Size-Control Chamfer Tool Improves Chamfer Concentricity.

1. Over travel feature compensates for error in part-positioning or over-feed of spindle.
2. Independent collars provide separate adjustments for upper and lower chamfers.
3. Remove single pin to replace low-cost cutter.
4. Thrust collar permits locating against work surface as spindle is piloted into part.

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Especially useful for deburring practically all types of metal. This tool has set new standards in removing burrs from round holes, without reversing the part. Assemble parts faster without burr interference. A screw at end of tool adjusts cutter blade tension. Adaptable to multiple spindle automatic machines.

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VERTICAL MILLING MACHINE

The feeds, either forward, rapid traverse or rapid reverse, are changed by means of electro-magnetic multi-plate clutches.



TURRET LATHE

On which spindle speed changes are made through electro-magnetic multi-plate clutches.



VERTICAL TURNING AND BORING MILL

On which the electro-magnetic multi-plate clutch ensures gentle, but firm braking.

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MODEL 103

- UNSURPASSED PRODUCTION RATES
- CONTINUOUS TURRET OPERATION
- VARIABLE TURRET AND SPINDLE SPEEDS ADJUSTABLE WHILE RUNNING
- PRODUCTION UP TO 70 PIECES PER MINUTE

Here is a machine that really solves the problem of finishing circular mouldings and diecastings—AT UNSURPASSED PRODUCTION SPEEDS. Applications are almost unlimited, as it is possible to use cutters, carbide files, grinding and buffing wheels, abrasive and buffing belts—in fact, any type of tooling that can be mounted on the working arc of the back table.

MODEL 103-B is a similar machine operating with an intermittent motion and its index mechanism permits dwelling at tooling station
Production up to 20 pieces per minute

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Diameter range, ten spindles ..	0in. to 4½in.
Height range	0in. to 8in.
Number of spindles 10

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CENTRAL SYSTEM consisting of eight No. 10 Magnetic Coolant Separators and arranged to accommodate the complete coolant flow from the machine area as shown at one of the leading Engineering Companies.

Savings in production time and machine maintenance are averaging a return of 200 to 400 per cent. an investment in the first year of operation. Added to these savings is the greatly improved quality of product finish. If you haven't already investigated the production savings and advantages realized with **BARNESDRIL MAGNETIC COOLANT SEPARATOR** equipment.

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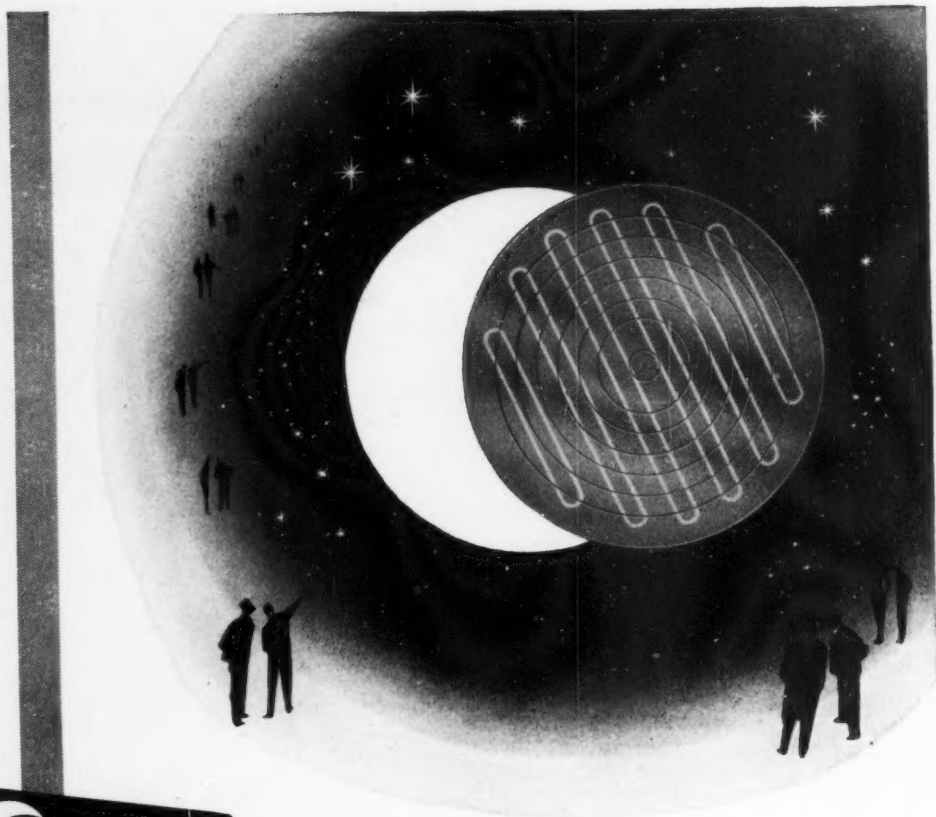
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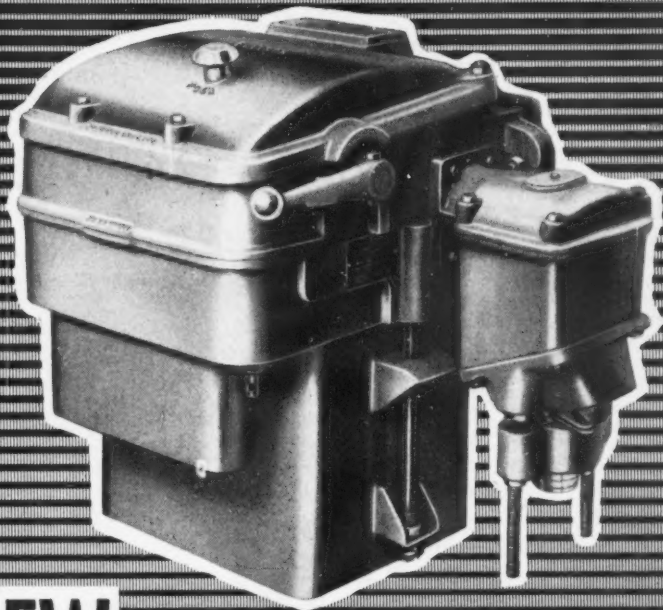
The first permanent
magnet chuck—the
best permanent
magnet chuck

Ask for the valuable publication "Some Facts about Permanent Magnet Chucks" PM 150/155

Made by James Neill & Co. (Sheffield) Limited — the originators of this equipment
Supplies through your usual "Eclipse" Dealer

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PM 126

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OF UP TO 660****300 HP DIRECT-TO-
LINE STARTER****A.S.T.A. TESTED TO
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25 MVA at 400 VOLTS****Continuing a Tradition**

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Abstracts of Principal Articles

The Production of Automatic Transmissions for Motor Cars P. 1132

After a brief history of Borg-Warner, Ltd., who started the production of automatic transmissions in this country some two years ago, this article describes the design and operation of the unit, which incorporates a hydraulic torque converter and two planetary gears, with hydraulic ratio selection. Operations on the rear extension case are then discussed, starting with the grinding of the mounting face on an interesting double-table vertical-spindle surface grinder. After a milling operation, the castings are passed to a Cross transfer machine, on which most of the drilling, tapping, and rough and semi-finish boring operations are carried out. The castings are loaded into pallet fixtures, in which they travel through the machine while operations on the main-shaft and other bores are performed. After being unloaded, they are returned to the starting point for a second series of operations. Castings are removed from the return track for certain milling and drilling operations, and they are subsequently re-loaded on the pallet fixtures at 90 deg. to their original position, for the second passage through the transfer machine. Four Heald fine-boring machines are then employed to finish all the important bores in the castings. (MACHINERY, 92-16/5/58.)

New Igranac Range of Heavy-duty Control Units P. 1144

Igranac Electric Co., Ltd., Bedford, have introduced a new range of heavy-duty, oil-tight control units for machine tools and other equipment, which includes push-buttons, selector switches, indicating lights and enclosures. The push-buttons are of unit construction, and up to four contact blocks can be mounted in the form of a stack and operated by a single button. A new Roto-push unit serves as both a push-button and a selector switch, a circuit being selected by means of a serrated sleeve and engaged by means of the central button. Pretest indicating lamps in the range are designed to allow the bulb to be tested by pressing the lens. (MACHINERY, 92-16/5/58.)

The Production of Shell Moulded Crankshafts P. 1159

Evinrude Motors, U.S.A., have eliminated the turning of counterweights and the drilling of pinholes in crankshafts for outboard motors by changing from forged to shell-mould cast components. The amount of stock that is removed from other surfaces has also been reduced, and less material is required. The shafts, of SAE 1615 steel, are cast in a highly-mechanized foundry, in which there is an automatic mould-making machine, with four stations, which can produce 120 shell moulds per hour. Sprues and gates are removed by semi-automatic oxy-acetylene cutting, prior to shot-blasting. Normalizing follows, and then tie bars are removed from between the counterweight cheeks with a semi-automatic abrasive cut-off machine. (MACHINERY, 92-16/5/58.)

Machining Bearing Housings on Monforts Chucking Automatics P. 1162

Bristol Commercial Vehicles, Ltd., are now machining bearing housings for large gearboxes on Monforts single-spindle chucking automatics. The work is carried out in two roughing and two finishing stages, and substantial savings in production times have been effected, as compared with the method that was previously employed. The latter procedure included grinding and fine-boring, and these operations have now been eliminated. The Monforts machine is of very rigid construction, and the spindle is driven through a P.I.V. box and a change-speed clutch. The turret and cross-slides are hydraulically operated, and their motions, also speed changing, are controlled by dogs and cams. (MACHINERY, 92-16/5/58.)

♦ ♦ ♦

The special machine here shown is employed in the material preparation department at the works of North American Aviation, Los Angeles, Calif., U.S.A., to produce smooth, rounded edges on titanium strip before it is stretch formed. By pulling the strip past a series of graduated cutting tools the required edge rounding is obtained, and the need for tedious hand filing has been obviated. The tendency for the titanium to crack during stretch-forming has thus been virtually eliminated.



Automation for Small-quantity Production

Hitherto, automation in the metal working industries has been associated principally with large quantity production which requires long runs on identical parts without any changes of set-up. For this purpose, transfer machines of in-line and rotary types are being employed very successfully, and in other instances individual machines are being arranged for automatic loading and unloading, and may be linked by conveyors or other work transfer equipment to provide for continuous processing of components through a series of operations. Recent developments have shown that such installations, which are necessarily very costly, need not be so inflexible as was at one time supposed, and it is now becoming increasingly common practice to make provision for subsequent rearrangement of units, or the introduction of additional machining stations to allow for possible changes in component design. On some transfer machines, moreover, a certain adaptability has been achieved, so that two or more parts, which are generally similar, but differ as regards certain details, can be processed. Provision may be made, for example, for the tools at certain stations to operate only on selected parts, or for the work fixtures to be selectively positioned in relation to the tooling. Despite these advances, however, it is evident that some quite different solution must be sought if corresponding improvements in manufacturing efficiency are to be obtained when parts must be produced in small batches.

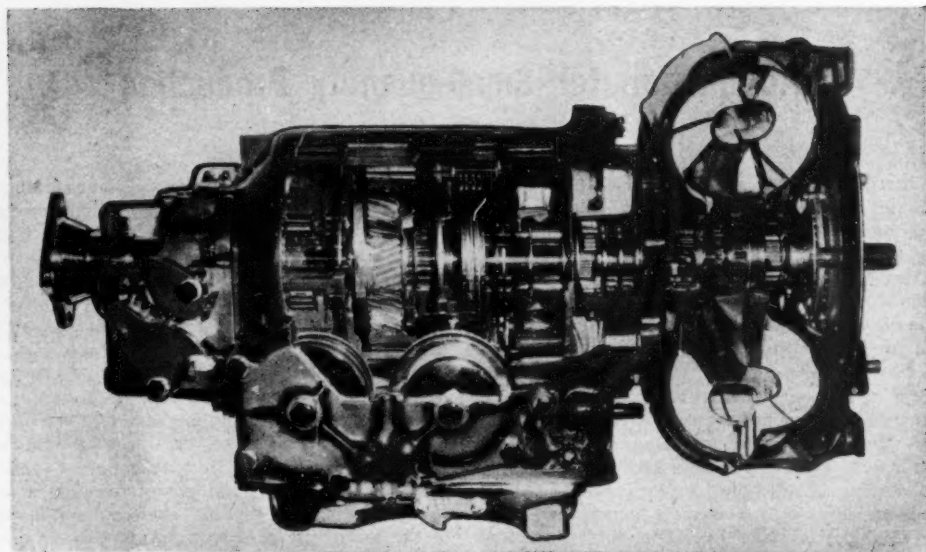
With another form of automation, which is now rapidly assuming greater importance, the relative positions of the work and tool, in two or three dimensions, are automatically controlled by means of punched cards, or punched or magnetic tape. Various systems have already been brought to a high stage of development, and have been applied, for instance, to automatic positioning on jig and horizontal boring machines, and to 3-dimensional milling machines for producing complicated workpieces, as required for aircraft structures. Provision may be made for accurate location at a series of points or for continuous control of the work or tool movement, and these arrangements have proved very effective where the nature of the operations is such that frequent tool changing is not required.

More recently, attention has been directed to automatic tool changing, both for large quantity

and for small batch production. Such automatic changing may be desirable where a machine is set up for continuous quantity production with automatic loading and unloading and automatic work gauging with feed-back control. Over a period, work size may be regulated by adjustment of the cutting tool to compensate for wear, but a point is reached at which a tool change is necessary, and this may sometimes be accomplished by bringing a fresh cutting edge into operation automatically. Tool changing for an entirely different reason may be required when a lengthy series of operations is to be performed on, say, a jig boring machine. One solution to the problem of bringing a series of tools into action, successively, for different stages in the machining of a workpiece, is to employ an indexing turret on the machine. As was described recently in MACHINERY, another approach has been adopted by a large company in the U.S.A. In this instance, an indexing tool carrier has been designed for use in conjunction with a jig boring machine, and each tool, as it is required, it automatically mounted in, and subsequently removed from the spindle. With automatic positioning, automatic control of speed, rapid approach, feed rate, and hole depth, and automatic tool changing, this machine affords an example of true automation applied to work with which the word is not normally associated.

It has become evident, indeed, that with a combination of suitably designed machines and card or tape control systems, fully automatic processing and a high degree of versatility are by no means incompatible. In this connection attention may be drawn to an installation in an American factory which may well establish a pattern for the future where parts are required to be machined in small and medium quantities. This particular installation comprises three machines, each of which is arranged for movements in three directions. The first machine provides for milling any number of faces; the second, which carries a horizontal 20-station tool turret, for drilling, reaming, tapping and counterboring; and the third, for boring holes of a wide range of sizes by means of a radially adjustable tool. Components are carried in fixtures which are automatically transferred from machine to machine, and can be automatically indexed to present different work faces to the tools. The

(Continued on page 1184)



The Production of Automatic Transmissions for Motor Cars

Methods Employed by Borg-Warner Ltd., Letchworth, Herts.

The only automatic transmission widely available in this country, at present, is the Borg-Warner unit, which is now being fitted to cars of capacities exceeding 2 litres, including some in the ranges made by Standard, Humber, Jaguar, Daimler, B.M.C., and Ford. In addition, the unit is incorporated in the Mercedes-Benz 300 saloon. Although automatic transmissions are comparatively new to this country, they were introduced in the U.S.A. in 1940, when the Hydramatic unit was offered for the Oldsmobile by General Motors Corporation. The Borg-Warner unit, designed after the war, was first fitted to the Studebaker range in 1950, and, since that time, more than 2,000,000 of the units have been produced in the U.S.A. Consequently, the Borg-Warner transmission is a thoroughly tested unit and all the troubles that are normally encountered with new designs have been eliminated by modifications. Indeed, it is now common for such a transmission to outlast the normal life of the car without requiring any treatment, other than the draining and changing of the oil at infrequent intervals.

Changes in manufacturing arrangements in the U.S.A. during recent years, and increases in torque transmission requirements, have led to a decline in the demand for this Borg-Warner unit in that country, and although the transmission was, until recently, being exported in small quantities to Europe, the total numbers required were not sufficient to allow of economical manufacture. The company was thus faced with two alternatives. Either they could continue to operate the existing plant in the U.S.A., relying on a gradual increase in the European demand, or they could start manufacture in Europe, on a more economical basis and nearer to the customers' factories, so that more effective relationships could be established with both motor car manufacturers and the car-buying public. The second alternative was eventually adopted, and since the firm already had a branch in this country, namely the Morse Chain Division, with a factory at Letchworth, Herts., a start was made, some two years ago, on the erection of another building there for the manufacture of automatic transmissions and overdrive units.

This factory, which now covers an area of nearly 200,000 sq. ft., has a capacity for producing up to 300 transmissions per shift, and is at present being operated on single shift. Most of the special equipment, including rotary and in-line transfer machines, employed in the American plant, still had some years of useful life, and was therefore transferred to this country, and supplemented by the purchase of a considerable amount of new British and German plant. In this article, and others to be published later, some of the more interesting operations on components for the Borg-Warner automatic transmission will be described. Before going on to consider production methods, however, it may be of interest to discuss briefly the operation of the transmission, and some of the advantages to be obtained from its use.

THE BORG-WARNER AUTOMATIC TRANSMISSION

The arrangement of the automatic transmission may be seen from the heading illustration, which shows a cut-away unit. A vertical section through the unit is given in Fig. 1, and the bell-housing at the left-hand end is designed to be attached, by its flange, to the rear of the engine crankcase.

Within this housing is the hydraulic torque converter, which is entirely self-contained in its sheet metal shroud. The torque converter incorporates two pressings A and B, each of about 11 in. diameter, which together form a ring of circular cross section. In the hollows of these pressings are fitted a number of pressed sheet metal vanes which are joined together and braced by two smaller annular pressings C, also of approximately semi-circular section. The impeller assembly, incorporating the pressing A, is located in, and is welded to, the flywheel, which, in the unit shown, carries the starter ring-gear. A splined member connects the flywheel/impeller assembly to the end of the engine crankshaft, and the turbine, housed in the pressing B, is splined to the ring-gear of the front epicyclic unit. Different arrangements are adopted for other units, and the starter ring-gear may be carried on an adaptor plate, to which the flywheel is secured, and whereby the torque converter is coupled to the engine crankshaft. Whereas the impeller vanes are arranged almost radially, those of the turbine are curved, and are disposed at a steeper angle, to assist the flow of oil from the turbine to the impeller.

Between the impeller and the turbine there is

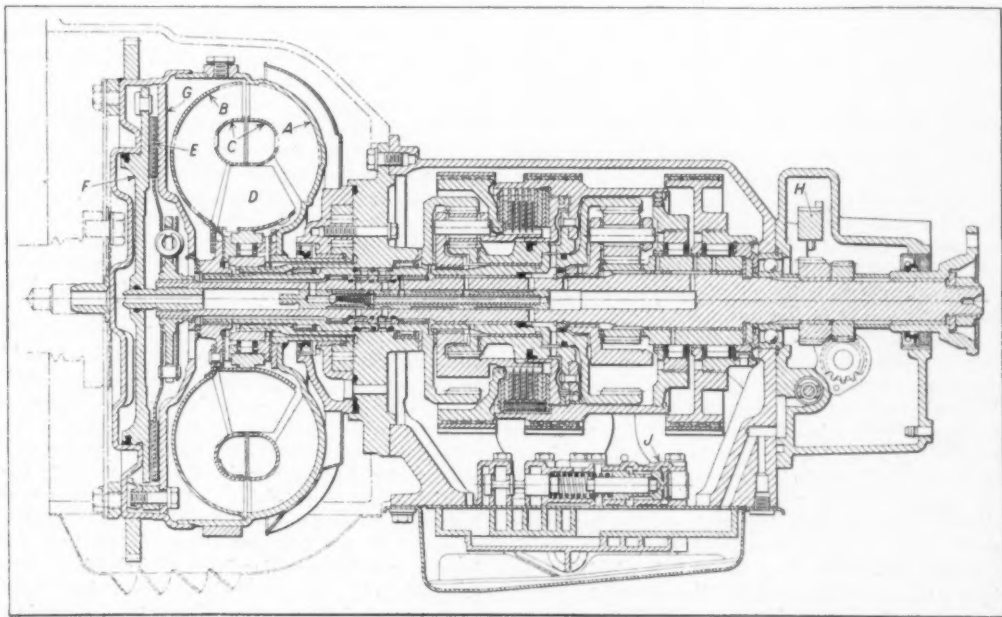
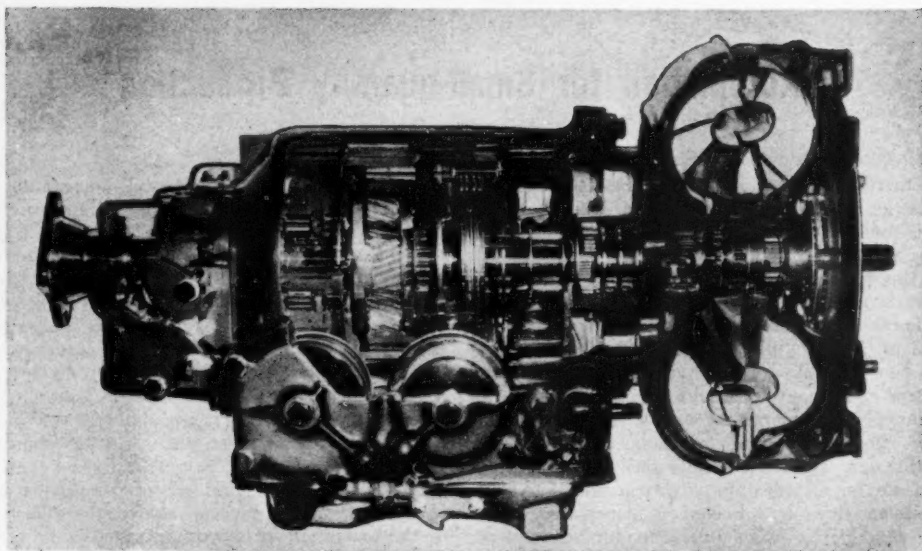


Fig. 1. Sectional View of the Borg-Warner Automatic Transmission, Showing the Hydraulic Torque Converter at the Left-hand End, and the Epicyclic Gear Units



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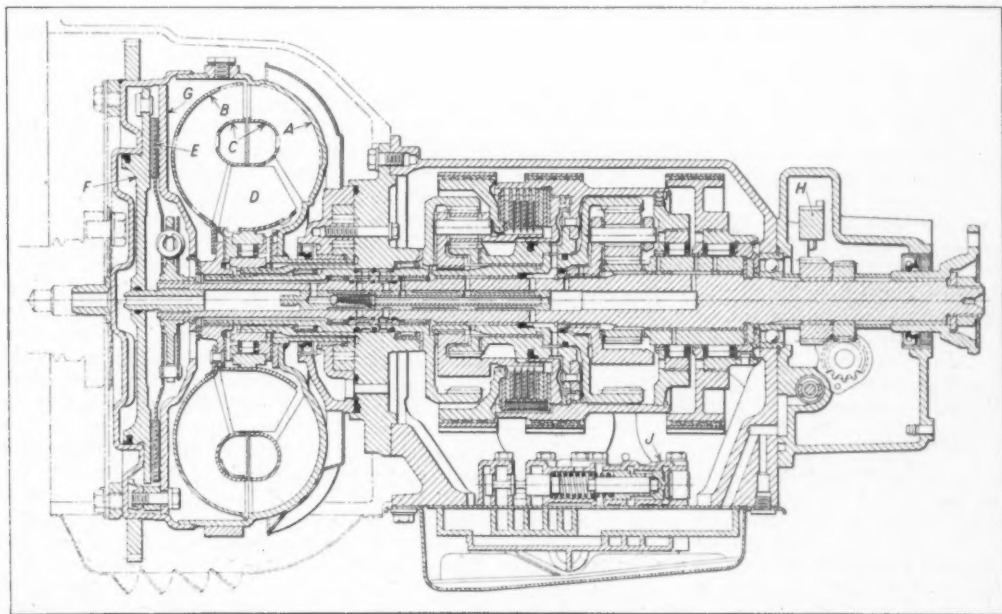


Fig. 1. Sectional View of the Borg-Warner Automatic Transmission, Showing the Hydraulic Torque Converter at the Left-hand End, and the Epicyclic Gear Units

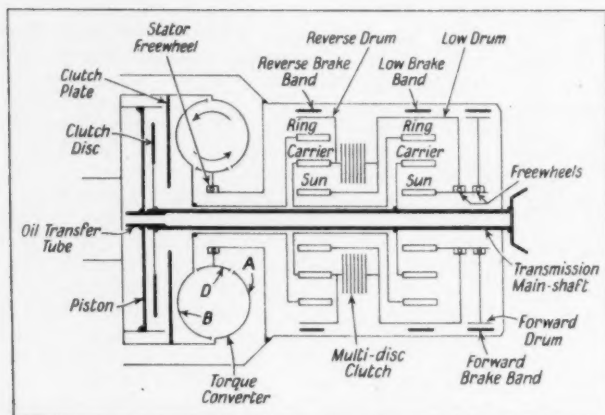


Fig. 2. Diagrammatic Layout of the Components in the Automatic Transmission

a stator *D*, which is carried on the end of a fixed extension to the transmission case, and has a number of fixed curved vanes on its periphery arranged at an angle to the main-shaft axis. This stator is mounted by means of a sprag-type clutch or free-wheel unit, which is so arranged that the stator can rotate only in the same direction as the engine. The complete casing is filled with low pressure oil when the unit is operating, and when the speed of the engine is increased above the idling point, with the vehicle stationary, centrifugal force acts on the oil, so that it tends to leave the periphery of the impeller, enter the turbine periphery and return to the eye, whence it must pass between the stator vanes. Thus, the stator resists the flow of oil from the turbine, and the torque applied to the transmission main-shaft is increased, when the impeller is rotating at a speed higher than that of the turbine.

When the turbine reaches the speed of the impeller, the stator can free-wheel in the same direction, so that torque multiplication ceases and the unit acts as a fluid coupling. In top gear only, a clutch disc *E* is held by oil pressure, applied by way of an automatic valve to the front of the piston *F*, against a face on a plate *G*, carried on the end of the main-shaft, so that there is a direct drive through the unit to the propeller shaft. The maximum amount of torque multiplication obtainable from the unit is slightly more than 2:1, in which condition the output torque is double that of the input. Efficiency of the converter varies with the speed of the car, and at the coupling point is approximately 95 per cent, this slight loss being eliminated when the

direct drive clutch is engaged for top gear.

Attached to the rear face of the torque converter bell-housing is the main casing of the unit, which contains two epicyclic gears, a multi-disc clutch, and three brake drums and bands, all of which are operated hydraulically to engage the various gears for one reverse and two forward speed ratio steps. An important feature of the design is that, in the "drive" range, all ratio changes are effected by means of clutches—first to second gear being engaged by the multi-disc clutch, and second to third, by the direct-drive clutch. Engagement of forward and reverse gears is performed by the application of the brake bands while the drums are stationary. In normal operation, only the low-gear band is applied to a rotating drum, and this arrangement reduces the generation of lining dust to a minimum.

The main casing contains two single-acting hydraulic cylinders on one side and one on the other, and these cylinders apply the brake bands to the drums when oil is supplied to their outer ends, springs being fitted in the cylinders for returning the pistons to release the bands. Two of these cylinders may be seen on the nearer side of the unit in the heading illustration. At the rear of the main casing there is an extension case, which houses a parking pawl *H*, with a tooth at one end. Beneath the tooth there is a grooved ring, splined to the main-shaft, and, for parking, the tooth is lowered through a linkage so that it enters one of the grooves, preventing the main-shaft, and consequently the rear wheels, from being turned. The tooth is normally held in the retracted position by hydraulic pressure when the car is moving, as a safety measure, thus ensuring that the pawl could not be engaged, even if the linkage were operated.

In addition, the extension case houses a governor, which is driven by a helical gear on the main-shaft, and serves to regulate the position of a valve controlling the supply of hydraulic oil to the multi-disc and direct-drive clutches. The governor shaft also drives a gear-type pump which supplies pressure oil for the operation of the unit for forward speeds exceeding 25 m.p.h., and in reverse gear. When the car is started, pressure oil is supplied by a separate internal-external gear-type pump in a collector ring at the front of the main casing, which is driven by the impeller. In addition to the hydraulic valve controlled by the governor,

there is another, more complicated valve unit, at J, which incorporates a number of intricate die castings. One of the plungers of this valve unit, known as the selector valve, is moved to the appropriate position, by means of the lever on the steering column, to pass oil to the brake band cylinders, when it is required to start the car.

The function of the epicyclic gear units in the selection of the forward and reverse drives may be more easily explained with reference to the diagrammatic drawing of the transmission unit in Fig. 2. Here, the impeller, the turbine, and the stator are indicated by the same letters as in Fig. 1, the latter, with its free-wheel arrangement, being carried on a projection extending from the main casing. In the automatic drive position of the steering column selector lever, the position of the plunger in the selector valves is such that oil can flow to the appropriate brake-band cylinders. For the forward speeds, the brake drum at the right-hand end of the unit is held by its band so that the sun wheels of both planetary sets are prevented from rotating on the main-shaft.

When the accelerator is depressed, under these conditions, and the turbine of the torque converter starts to turn, the drive is transmitted through the ring gears and planet gear carriers of each planetary unit, the carrier of the rear planetary drive being splined to the main-shaft. A double reduction is thus obtained, and the ratio has a maximum value of 4.6 to 1, and is progressively reduced by the torque converter as the speed of the car increases. When a predeter-

mined speed is reached, which is varied automatically according to the throttle setting, the position of the governor valve is changed, with the result that the hydraulic multi-disc clutch is engaged, and the sun gear is locked to the planet carrier of the front planetary train, so that the latter revolves as a unit. In the intermediate ratio, therefore, the reduction is obtained from the rear planetary set only, and it has a minimum value of 1.435 to 1 when the turbine of the torque converter is turning at approximately the same speed as the impeller.

Since both sun wheels are mounted on sprag-type clutches or free-wheel units of similar design to that employed for the stator, over-run of the car in either of these two ratios causes the propeller shaft to turn faster than the transmission main-shaft so that, normally, there is no engine braking until direct top gear is engaged. When top gear is engaged by means of the clutch disc at the front of the torque converter, the intermediate ratio setting of the planetary units remains unchanged, so that this ratio may be immediately re-engaged when required. Engine braking may be obtained in low gear by moving the steering column selector lever to the "low" position, whereupon oil is supplied to apply the low-gear brake band. Rotation of the front sun gear, relative to the main-shaft, is thus prevented, so that the latter drives the engine through the torque converter when over-run occurs. Reverse gear is engaged by the application of the brake band to the reverse gear brake drum at the front of the unit. When this

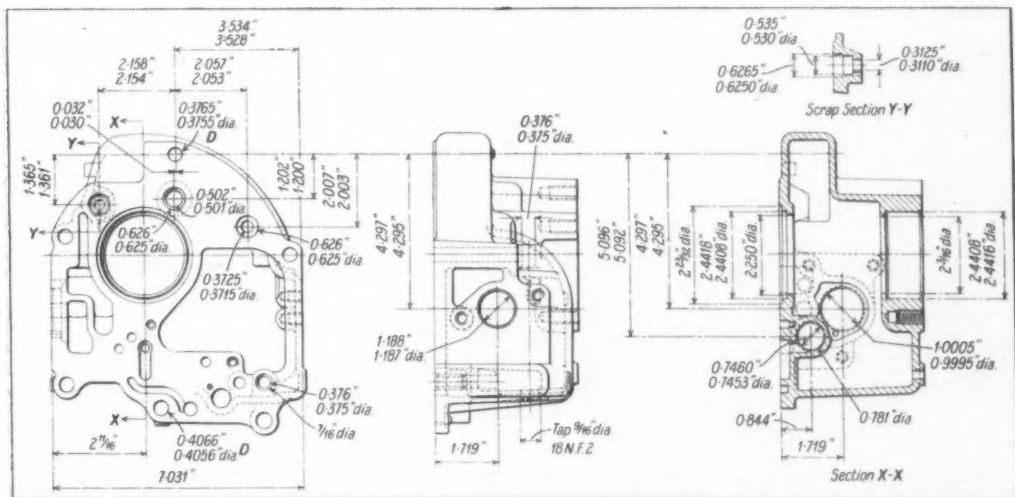


Fig. 3. Elevation and Sectional Views of the Rear Extension Casting for the Borg-Warner Transmission, with the Principal Dimensions. The Dowel Holes D, are Employed for Location Purposes

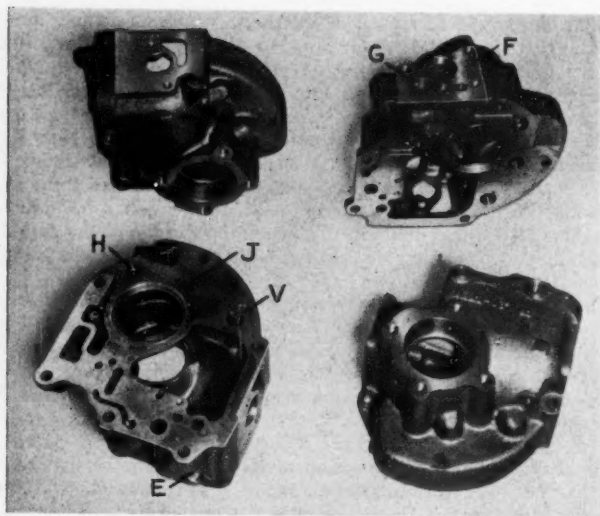


Fig. 4. Views of Four Completely Machined Rear Extension Castings, Showing the General Shape and the Surfaces and Bores which are Machined

brake is applied it prevents rotation of the planet carrier and ring gears of the front and rear planetary sets, respectively, and the drive is then taken through the ring and planetary gears of the front set to the low gear brake drum, and thence to a free-wheel on the main-shaft. With this arrangement the car can over-run in reverse.

The extra cost of an automatic transmission will largely determine whether or not a private driver will purchase a car so equipped. For operators of fleets of vehicles such as taxicabs, however, these transmissions offer several advantages. There is, for example, a reduction in driver fatigue, especially in dense traffic, since the need for frequent gear changing is eliminated. Moreover, the automatic controls of the unit ensure that the engine is continuously operated under optimum conditions. For instance, top gear cannot be held too long on gradients or in traffic queues so that the engine is caused to labour. Over-revving in the intermediate gears is also prevented, although the maximum power of the engine is still available for use in emergency. The fact that the Borg-Warner unit has reached a high stage of development over a number of years, and that it is being produced in sufficient quantities to enable efficient methods to be employed, should also contribute to its widespread adoption.

OPERATIONS ON REAR EXTENSION CASTINGS

A drawing showing the rear extension casting for the Borg-Warner automatic transmission in elevation and section is given in Fig. 3. As already

mentioned, the rear extension serves to house the centrifugal governor and the hydraulic valve which it controls, also the parking pawl, with its operating linkage, lever, and hydraulic safety detent. In addition, the rear extension provides mounting surfaces for the separate gear type pump at one side, and for the speedometer drive shaft at the other. Since the main-shaft passes through the casing, a register at the front end provides for its location on the outer race of the ball bearing which carries the rear end of the shaft, and there is an oil seal in a bore in the rear end of the

casing, surrounding the driving flange, which provides for connection to the propeller shaft of the car. The casting is of iron to B.S.S. 1452, grade 14, and its hardness is within the range 170 to 223 Brinell. All the castings employed by the company are bought out, iron castings being supplied by Qualcast, Ltd., and before the extension castings are machined they are subjected to a visual examination, and a sample check for hardness is carried out.

A good idea of the shape of the casting, and of the amount of machining required, may be obtained from an examination of the four completed castings shown in Fig. 4. Since the castings incorporate passages for hydraulic oil, they are first subjected to a cleaning process to remove all traces of sand or other inclusions which might contaminate the oil in service and cause trouble. This cleaning is carried out by the Kolene (Cast-ignite, Ltd.), process, as described in *MACHINERY*, 89/176—20/7/56, and the castings are first packed into wire baskets, each of which holds about 4 cwt. The basket is then lowered into a bath comprising a hygroscopic alkali base with neutral salts, and connected to the positive lead of a current supply of 1,500 amp. at 0.3 volt, the negative lead being connected to the tank. The salts are maintained at a temperature of 450 deg. C. and the catalytic action reduces and dissolves the oxides burned into the casting surfaces, even within the cored passages.

After the cleaning stage, which occupies about 10 min., the basket is removed from the first tank, rinsed in an adjacent tank of cold water, and finally washed in hot water, so that, when the cast-

ings are removed, they are sufficiently hot to dry naturally, without rusting. The entire cleaning process occupies about 20 min. for a 4-cwt. load. Cleaned castings are loaded into large box pallets for transport to the first machining operation which is carried out on a No. 710 Besly-Bowen (Buck & Hickman, Ltd.), vertical spindle surface grinder, equipped with two tables. At this stage, the large mounting face is finish-ground from the rough, flat within 0.003 in. total indicator reading, and with a surface finish of 100 micro-in. The two tables of the machine are fitted with different fixtures, and each fixture is designed to hold two different components for the automatic transmission.

A close up view of one of the tables, showing the fixture for the rear extension case, is given in Fig. 5, and it will be seen that the castings are loaded, face upwards, in nest-type locations. Each of the four castings rests on three integral cast bosses, provided for the purpose, and is separately clamped by a nut and eccentric washer at the upper end of a post which projects upwards through the main-shaft bore. When the nut is tightened, with the aid of the spanner shown, the washer is first partially rotated, so that it occupies a position above one of the surfaces inside the casting, and further tightening of the nut then applies pressure to the washer to clamp the casting. Four oil pump bodies are loaded at the corners of the same fixture, as shown, and are secured by cam type clamps, as at A, which are tightened with the same spanner. On the other table of the machine, there is a fixture designed to hold four of each of the two different types of hydraulic cylinders, whereby the brake bands, mentioned earlier, are applied to the planetary gear unit drums.

Each fixture is unloaded and re-loaded while the components in the fixture on the other table are being ground. The automatic machine cycle occupies 3 min., and during this time, up to $\frac{1}{16}$ in. is removed from the casting faces. Each table is driven at a speed of 75 r.p.m. by a Vickers, swash-plate type, hydraulic motor of 10 h.p., supplied from a self-contained pump unit at one side of the machine. Another hydraulic motor provides for indexing the grinding head, from the position above one table to the alternative position, at the end of each grinding cycle. The grinding head is carried on a massive cylindrical post set between the

tables and slightly to the rear, and the spindle is driven by a motor of 30 h.p., which can be seen at the extreme right in Fig. 5.

This motor drives the vertical spindle in the left-hand end of the housing, through V-belts enclosed within the cover at the top in Fig. 5. A Carborundum wheel of C36-H5-BR specification is employed, and is of 18 in. diameter, with a face width of 3 in. This wheel is driven at a surface speed of 4,400 ft. per min. A cam, driven through one complete revolution per machine cycle by a 2-h.p. motor, controls the vertical movements of the grinding head, which is lowered under gravity, to apply the cut, as the cam rotates. At the end of the cycle, the head is returned to the original height by the cam, and it is adjusted downwards by a handwheel, before the next cycle is initiated, to compensate for the wheel wear.

From the surface grinder, the castings pass to a Kent-Owens (Catmur Machine Tool Corporation, Ltd.), vertical milling machine, on which the rear face is finished, to give an overall thickness, from the front to the rear face, of 4 ± 0.005 in.

CROSS IN-LINE TRANSFER MACHINE

Almost all the remaining operations on the casting are carried out on a Cross Transfer-Matic 12-station in-line transfer machine, and a general view of the loading station of this machine, which has a capacity of 65 components per hour, is

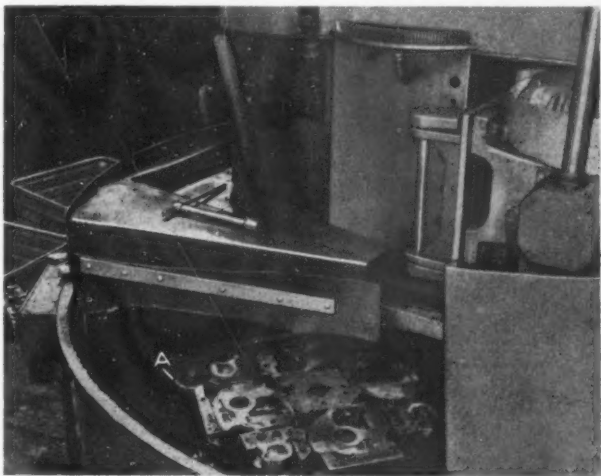


Fig. 5. Close-up View of One of the Two Tables on the Besly-Bowen Vertical-spindle Surface Grinder, Showing the Fixture in which Four Rear Extension and Four Oil Pump Body Castings are Accommodated Simultaneously

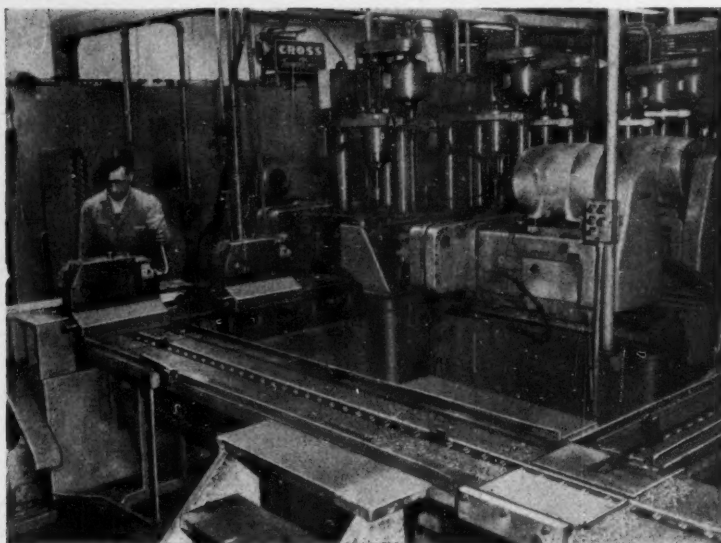


Fig. 6. General View of the Cross Atlantic In-line Transfer Machine for Operations on Rear Extension Castings, Showing Part of the Pallet Return Track and, at the Left, the Loading Station

given in Fig. 6. All the machining stations are arranged in a single line, and the pallet type fixtures are designed to hold two castings, in different positions. Thus, each casting passes through the machine twice, first time in a rough and then in a semi-finished condition. The pallets are returned to the loading station along a track forming three sides of a rectangle, of which the Cross machine is the fourth side. When the pallets reach a position on the side opposite to the Cross machine, they stop at two machines on which certain operations are performed to provide for location of the castings when they are subsequently reloaded in readiness for the second circuit.

A close-up view of one of the pallets, at the loading station, is given in Fig. 7, and the rough casting is first loaded, as shown, inside the box-like fixture, in the position of that seen at the upper left in Fig. 4, with the speedometer drive face upwards. During loading, the casting is initially placed on three support pads, with its ground face in contact with a vertical face inside the fixture. A star wheel *B* is then tightened to clamp the casting temporarily, while the hinged side of the fixture is lifted, and is secured by the pivoted bolt at the top, a spanner being provided for tightening. This hinged side of the fixture

has an opening of approximately rectangular shape, in which there is a universally-mounted plate of the same proportions. A stud *C*, and two other studs on the plate, are pressed against the casting, to clamp it against the locating face, when the hinged side of the fixture is secured.

Since the first series of operations carried out on the transfer machine is concerned with boring the main-shaft hole, location of the casting for the second circuit is obtained by means of a spigot which fits into the bore in the front face. Dowel holes, *D*, Fig. 3, in the face provide for angular location, and the casting is clamped in an inverted position with the aid of a captive

C-washer and a nut on the reduced-diameter end of the spigot. The casting is secured to the leading face of the fixture for the second stage, and the operator in Fig. 6 is seen in the act of tightening the securing nut. There are 17 pallets on the machine, and of these one is normally at the loading and another at the unloading station, and a third at the position of auxiliary machines, previously mentioned. Movement of the pallets through the Cross machine is obtained by the conventional method, a hydraulically-operated transfer bar being provided with fingers which are interposed between the platens when the bar is turned through 90 deg., by another hydraulic cylinder. The platens are dowel-pin located at each station, and are hydraulically clamped for the machining operations.

Rough-machining of the main-shaft bore in the ground face of the fresh casting is carried out by the right-hand head, as viewed in the direction of travel of the pallets through the machine, at the first operating station. This head is seen at the right in Fig. 6, and in addition to finishing the 2½-in. counterbore, which accommodates a circlip for securing the main-shaft ball race in position in the final assembly, it carries another tool which semi-finishes the 2¼-in. diameter clearance bore for the shaft. Other spindles on this head drill

and spot-face five other holes ranging from $\frac{1}{8}$ to $\frac{3}{8}$ in. diameter. A spindle in the left-hand head at this station is equipped for rough-machining the main-shaft bore in the rear end of the casting. This bore contains an oil seal in the final assembly, and it is machined to within 0.050 in. of the final size. At the same time, the cored hole is opened out to a diameter of $2\frac{1}{8}$ in. and two other holes are drilled. The other spindles on this head operate on the second-stage casting carried on the front of the fixture, to drill fixing bolt holes in the speedometer drive face.

The first machining station is also equipped with a vertical drill head, carried on pillars supported by the bush plates for the side heads. A single drill in this head produces a $\frac{1}{2}$ -in. diameter hole in the upward-facing surface of the second-stage casting, in the position indicated at *E*, Fig. 4. At Station 2, the right-hand head semi-finishes the 2.4408/2.4418-in. diameter register in the face of the first-stage casting, which provides for its location on the outer race of the main-shaft ball bearing in the final assembly. In addition, a number of other holes are drilled in the ground face of this casting, including the two dowel holes *D*, Fig. 3, which are subsequently finish-reamed. Three more drills, in this head, operate on the oil-pump mounting face, *F* Fig. 4, of the second-stage casting to form counter-sinks at the positions at which bolt holes will later be drilled. The left-hand head at this station carries tools for semi-finishing the bore for the main-shaft oil seal at the rear end of the first-stage casting, and for a number of spot-facing operations. Two other spindles provide for drilling the mounting-bolt holes in the speedometer drive face of the second-stage casting.

With the right-hand head, Station 3, seven holding down bolt holes are drilled in the first-stage casting, in addition to four other holes, also one hole of $\frac{1}{2}$ and one of $\frac{3}{8}$ in. diameter in the oil-pump mounting face, *F* Fig. 4, of the second-stage casting. There is no left-hand head at this station, but a vertical head is employed to spot-face the end of the hole *E*, Fig. 4, in the second-stage casting. One of the tools applied to the ground face of the first-stage casting at Station 4 is arranged to enter a hole drilled at a previous operation, and to drill a tapping size hole through the rear wall. Other tools, in the right-hand head at this

station, perform drilling and spot-facing operations, and rough counter-bore the hole *H*, Fig. 4, which accommodates the safety plunger for the parking pawl linkage in the final assembly. An $\frac{1}{8}$ -in. diameter hole is also drilled in the second-stage casting, at the position of the hole *G*, Fig. 4, to a depth of nearly 3 in. There is no left-hand head at this station.

The vertical head at Station 4 carries a long drill which passes through the hole *E*, Fig. 4, to the further side of the casting, to drill a $\frac{1}{2}$ -in. diameter hole. The two locating dowel holes, *D* Fig. 3, in the first-stage casting, are reamed, to the limits shown, by tools in the right-hand head, at Station 5. In addition, three other holes in the ground face are reamed, one with a stepped tool, and a small hole is drilled. A single spindle in this head operates on the hole *G*, Fig. 4, of the second-stage casting, drilling the outer end to a diameter of 0.781 in. for a depth of $1\frac{1}{2}$ in. There are no other heads at this position.

Of five spindles in the right-hand head at Station 6, four operate on the first-stage casting, for reaming two holes, drilling another, and spot-facing an internal boss. This spot-facing operation is carried out, with a Scully-Jones expanding facing tool, on the rear of the hole *J*, Fig. 4, for the shaft which carries the parking pawl. A reamer in the fifth spindle operates on the second-stage



Fig. 7. At the Loading Station for the Cross Transfer Machine, a Partly-machined Casting is Loaded at the Leading End of the Fixture and a Fresh Casting Inside the Fixture, where it is Clamped by the Hinged Door, Here seen Open

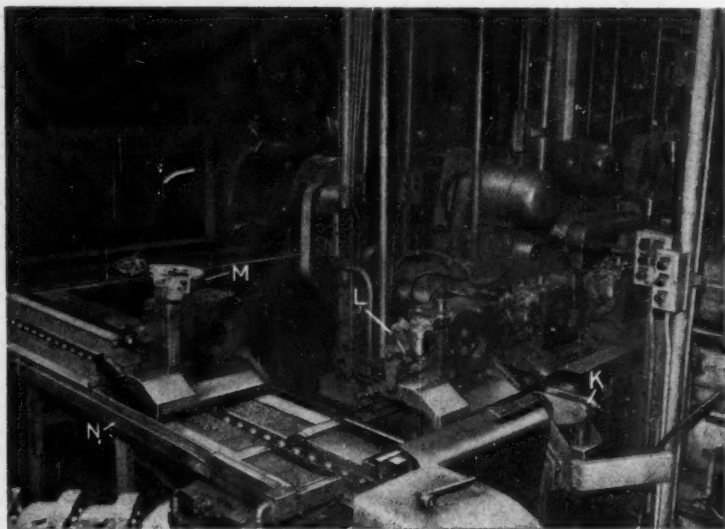


Fig. 8. On arrival at the Unloading Station of the Cross Machine, the Casting From the Leading End of the Fixture is Removed, and the Casting from inside the Fixture is Placed on Top, as at *M*, so that it may be Removed for Certain Auxiliary Operations at an Intermediate Station

casting, to semi-finish the inner portion of the bore *G*, Fig. 4. The $\frac{1}{2}$ -in. diameter hole partly drilled by a vertical head at an earlier stage, is continued through the second-stage casting by another head at this station. There is no left-hand head.

Two small holes are drilled by the right-hand head in the first-stage casting at Station 7, and the largest hole in the face *F*, Fig. 4, is rough and semi-finish bored in the second-stage casting. The single spindle of the left-hand head operates on the speedometer drive face of the second-stage casting, to rough and semi-finish bore the large hole in line with that just mentioned. A line reamer in the vertical-head spindle finishes the bore *E*, Fig. 4, and the bore in the other wall of the second-stage casting, to diameters of 0.514/0.517 and 0.375/0.376 in., respectively. These bores accommodate a transverse shaft which forms part of the governor mechanism in the assembled extension case.

An oil-way hole is drilled in the ground face of the first-stage casting at Station 8, by the right-hand head, and a stepped hole is finish-reamed. The left-hand head at this position also operates on the first-stage casting, drilling one hole and reaming another. Holes in both the first- and second-stage castings are tapped by heads at the

left- and right-hand sides at Station 9, and some minor holes are drilled, in both castings, by the right-hand head at Station 10, to complete the series of operations on the Cross machine proper. For the boring operations described, cutting speeds of about 200 ft. per min., with feeds varying between 0.005 and 0.0075 in. per rev., are employed. Drilling is performed at speeds of the order of 50 ft. per min., with feeds of 0.002 to 0.004 in. per rev., these speeds being chosen to ensure as long a tool life as possible.

A view showing the unloading station of the Cross machine is given in Fig. 8, where the link whereby the transfer bar is connected to the

vertically-mounted hydraulic cylinder, which turns it to engage the pallets, is seen at *K*. At this station, the finished second-stage casting *L*, at the leading end of the fixture, is unloaded and placed on the upper end of an adjacent inclined roller conveyor, down which it is fed by gravity to the next operation. At the same time, the partially-completed first-stage casting is removed from its position within the fixture, the door of which is re-fastened, and placed on top, as shown at *M*, where it is retained by a stub spigot. The next longitudinal indexing motion carries this unloaded fixture to the position at the extreme end of the transfer machine, shown empty in Fig. 8, where it operates a micro-switch. The machine cycle is then started, and the current supply to the driving motors of the pallet return track is switched on. As a result, the pallet which has just been moved to the end of the Cross machine line, is carried away from the machine, as shown, along the return track *N*.

When the pallet reaches the further end of the track *N*, it is aligned with that portion of the return track which extends parallel to the transfer machine, the driving peg being automatically disengaged as the conveyor chain passes over the pulley at the far end. A driving peg on the conveyor chain for the portion of the return track

parallel to the Cross machine then moves the pallet to the right until it reaches an intermediate station, about half-way along the track, and at this point the conveyor motors are switched off. A view of the intermediate station, which is adjacent to the two machines employed for certain auxiliary operations on the castings, is given in Fig. 9, where some of the horizontal heads of the Cross machine are to be seen on the right.

During the transfer of the unloaded pallet from the end of the transfer machine to the intermediate station, the pallet which previously occupied that station is moved to the end of the parallel track, and thence to the loading station shown in Fig. 6. A buffer stock of castings, on which the operations performed on the two auxiliary machines have been completed, is maintained at the intermediate station, so that the continuous operation of the Cross machine is not affected by a breakdown or tool-changing on the auxiliary machines. When a newly-unloaded pallet arrives at the intermediate station, as shown at *P* in Fig. 9, the casting carried on the stub spigot is removed, and is replaced by one on which the auxiliary operations have been completed, so that the pallet may continue its journey without delay when the conveyors of the return track are next operated.

The first machine into which the partly-machined first-stage casting, taken from the pallet *P*, is loaded, is seen in the foreground in Fig. 9. This Cincinnati 3 by 24 duplex milling machine is employed to finish the mounting faces for the oil pump and speedometer drive head on opposite sides of the casting. A surface finish of 125 micro-in. is specified for these faces, and they must be parallel with each other, and square with the main-shaft bore and the bore for the governor drive shaft, which also drives the oil pump and the speedometer head, within 0.0015 in. total indicator reading. The casting is loaded with its ground face in contact with datum pads on the front of the fixture on the milling machine,

and is located by the two dowel holes. Clamping is effected by an air cylinder above the fixture, which applies three clamping fingers, through rack and pinion mechanisms, when a valve is operated.

Two 6-in. diameter cutters, each with 20 carbide-tipped teeth, are mounted on the machine spindles and are driven at a speed of 315 r.p.m., the table feed being 1½ in. per min. The machine cycle is automatic, and after the casting has been traversed sufficiently far for cleaning up both faces, the cutters are stopped and the table is returned to the loading position. During the machining cycle, the operator seen in Fig. 9, who tends both machines, loads another casting, on which the milling operation has been completed, into the fixture of the Edlund column drilling machine in the background. This fixture also has dowel locations for the casting, which is loaded with the ground face vertical and the oil pump mounting face *F*, Fig. 4, upwards. The single vertical spindle drills a 7/8-in. diameter oil passage hole in the oil pump face.

An outrigger bracket, at the right-hand side of the machine table, carries a small, single-spindle, unit head, which is employed to counter-bore a hole in the ground face of the casting to a diameter of 1½ in. When the drilling operation has been completed, the casting is either placed on the stockpile or returned to one of the pallets at the intermediate station, as convenient. Only three men

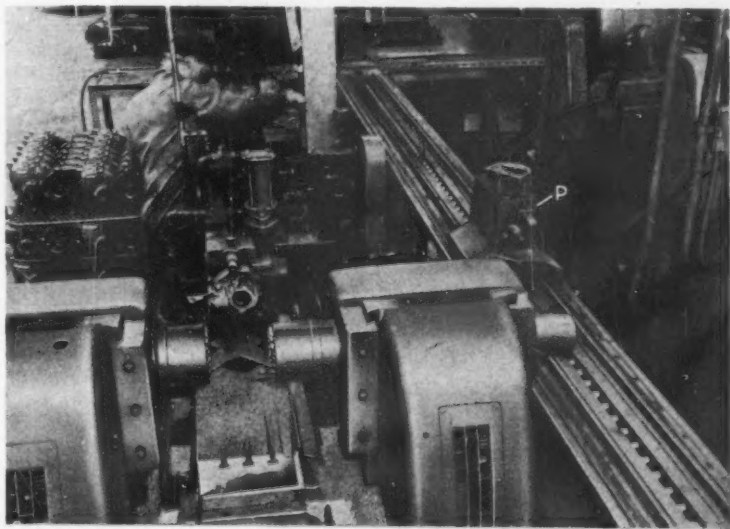


Fig. 9. A View of the Intermediate Station on the Pallet Return Track. The Pallet *P* has Just Reached the Station, with a Partly-machined Casting

are required for the operation of the Cross unit and the auxiliary machines.

FINE-BORING OPERATIONS

The inclined roller conveyor on which the completed second-stage castings are placed, when they are unloaded from the front of the pallet fixtures on the Cross machine, leads to a group of four Heald (Alfred Herbert, Ltd.) Bore-Matic fine-boring machines on which all the important bores are finished to size. The first of these machines is shown in the background in Fig. 10, and it is equipped with two spindles. The casting is dowel-located on the vertical face of the fixture, with the speedometer drive face upwards, and is clamped hydraulically at two positions. Three tools in the spindle at the right are employed to finish two of the diameters at the front end of the main-shaft bore, one of them to $2\frac{1}{2} \pm 0.001$ in., and the other, which forms a register for the outer race of the main-shaft ball bearing, to 2.4408/2.4418 in. diameter, and to chamfer the end of the bore. The left-hand spindle has two tools and is employed to finish the bore in the rear end of the casting to 2.4408/2.4416 and to chamfer the end. The two bores must be in line within 0.002 in. total indicator reading.

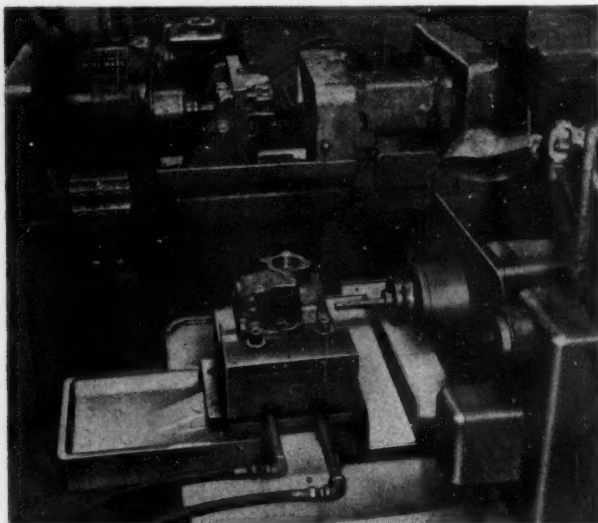


Fig. 10. On the First of Four Heald Fine-boring Machines, seen in the Background, the Main-shaft Bores are Finished. The Second Machine, in the Foreground, has a Single Spindle and Operates on the Governor Valve Bore

After being unloaded from the first Heald machine, the castings are passed to the single-ended machine in the foreground in Fig. 10, which has only one spindle. A single tool in this spindle is employed to finish the major portion of the bore G, Fig. 4, for the governor valve assembly, to a diameter of 0.7453/0.7460 in. The casting is loaded in a horizontal position and is again clamped hydraulically. On the third Heald machine, which is of the double-ended type, there are two spindles which finish the bores in the oil pump mounting face F, Fig. 4, for the pump spigot, and in the speedometer drive face, for the head spigot, to diameters of 1.187/1.188 and 0.9995/1.0005 in. respectively, and chamfer the bore ends.

The set-up on the fourth Heald machine is shown in Fig. 11, and it will be seen that the casting, which is dowel-located, is clamped to the vertical face of the fixture by means of a forked lever R, provided with two pressure pads. This lever is secured at its lower end to a shaft, which is held in a bore in the fixture, and at the outer end this shaft carries another short lever S. After the casting has been placed in position, the cam T is turned by means of the handle. The lever S is thus lifted so that the shaft is turned, and the clamping lever R is pressed against the casting.

Each of the three spindles on this machine has two tools, and these are employed to line bore two diameters co-axial with each of the holes indicated at H, J and V, Fig. 4. The rear spindles operates on bores in line with the hole H, Fig. 4, in which the hydraulically-operated safety plunger for the parking pawl is accommodated in the final assembly. Two bores aligned with the hole J, Fig. 4, for the parking pawl mounting shaft, are finished by the central spindle, and the front spindle operates on two bores, co-axial with the hole V, Fig. 4, in which the shaft for the parking pawl operating linkage is subsequently fitted. These bores range in diameter from 0.3125 to 0.6265, and they are held to a tolerance of 0.001 in. for size, and concentric within 0.002 in. total indicator reading. Sample checks of the bores are carried out by the operators, at the machines, with conventional equipment.

Following the final fine-boring operation, the castings are passed to two drilling machines on which the four $\frac{3}{8}$ -in. by 16 U.N.C. 2B holes in

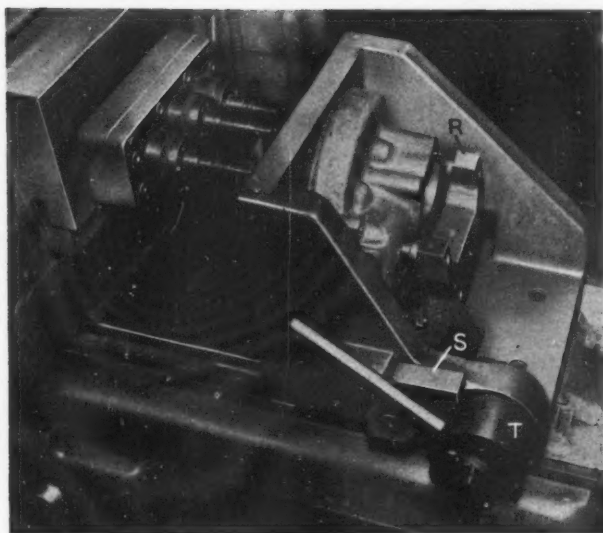


Fig. 11. At the Final Fine-boring Set-up a 3-spindle Head is Employed to Finish the Three Bores Associated with the Mounting, Operating Linkage, and Safety Plunger of the Parking Pawl

the rear face are drilled and tapped, if required. These holes are employed for mounting an adaptor to suit the particular vehicle in which the trans-

mission is to be fitted. The governor valve operating-shaft hole E, Fig. 4, is then threaded with a tap having an extended pilot, which enters a co-axial bore and provides guidance during the operation. Finally, the castings are cleaned by blasting with broken walnut shells in a Ruemelin cabinet, washed in clear paraffin, inspected, and transferred to the assembly shop.

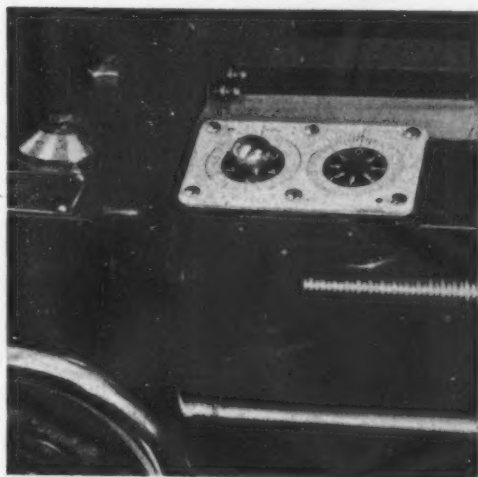
Other articles in this series, to be published shortly, will be concerned with the operations on the main transmission case and the main-shaft for which various interesting machines are employed.

Ceewrite Lathe Carriage Traverse Indicator

Shown mounted on an Edgwick centre lathe, in the accompanying illustration is the Ceewrite indicator, for accurately registering the carriage traverse movement, which is now being marketed, exclusively, by Alfred Herbert, Ltd., Coventry. It is available in eight types, fitted with dials reading in either fractions or decimals, and it is stated that the carriage movement is indicated to an accuracy of 0.001 in., so that the need for conventional micrometer stops is obviated. The dials can be set to zero, and any number of precision length-turning operations can then rapidly be carried out by direct reading, using the whole traverse-length of the machine lead screw, where required.

The method of attachment for the indicator varies according to the type of lathe, but usually, as may be observed in the accompanying illustration,

it is attached to the right-hand side of the saddle. It can be adapted to almost any centre lathe provided with a leadscrew.



The Ceewrite Traverse Indicator, which Eliminates the Need for Micrometer Stops, is Here Seen Fitted to the Carriage of an Edgwick Centre Lathe

New Igranic Range of Heavy-duty Control Units

A new range of heavy-duty, oil-tight control units for machine tools and other equipment has recently been introduced by Igranic Electric Co., Ltd., Bedford, and includes push-buttons, selector switches, indicating lights and enclosures. Special attention has been paid in the design of the units to ensure that when push-buttons and other units are panel-mounted, the space required behind the panel is reduced to a minimum. As a result, the back-of-panel space needed is only 1½ in., unless the push-buttons are arranged in stacks, as will later be explained.

At the left in Fig. 1 is shown a typical push-button unit from the new range. The contact block is moulded from phenolic plastics material, and is only 1½ in. deep. Terminals are securely

staked in position, and the block is designed for one-hole mounting or base fixing. The mounting centres for multiple push-button panels are 1½ in. in one direction and 2¼ in. in the other. Of unit construction, the push-button comprises a contact block, push-button actuator, legend plate and locking ring. Each contact block is self-contained, as indicated at A in Fig. 2, and is divided into two, completely-isolated compartments. In each compartment there is an individual switch unit, with a cone-pointed operating plunger, as may be seen at B. The two switch units housed in each contact block may both be of the normally-open or normally-closed type, alternatively one may be normally-open and the other normally-closed. These units are isolated mechanically

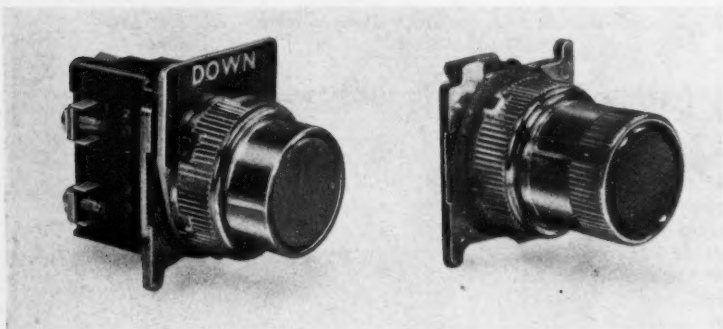
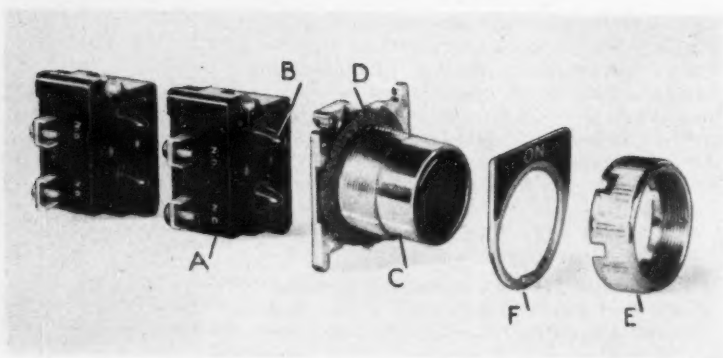


Fig. 1. A Push-button (left) and a Roto-push Unit from the New Igranic Range of Heavy-duty, Oil-tight Control Units

Fig. 2. The Unit Construction of the Push-button Switches in the New Igranic Range is Here Clearly Shown



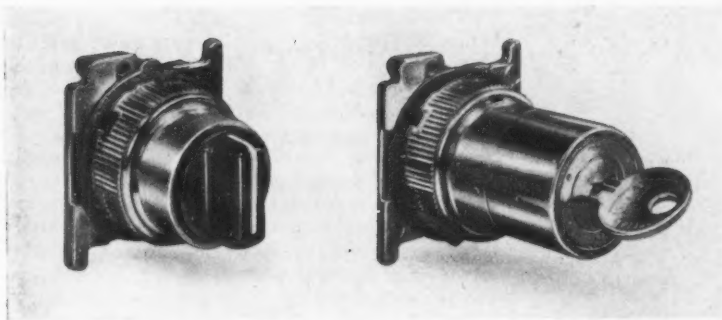


Fig. 3. Selector Switch Actuators for Use with the New Igranic Control Units. These Actuators are Employed with Stacks of Contact Blocks in Place of Push-button Operating Units

and electrically so that different voltages, or even A.C. and D.C. supplies, may be applied to the same contact block. The type of contact arrangement is clearly marked on the side of the block, by the letters NC or NO. Tamper-proof, silver contacts are fitted, which do not require dressing, and close with a rolling motion.

When required, two, three, or four contact blocks can be arranged in a stack so that they are operated by a single push-button. Captive screws for fixing purposes are provided on each block, and thrust, from the push-button actuator, is transmitted through the cone-pointed plungers from one block to the next in the stack. By positioning the blocks so that each is set at 180 deg. to its neighbour, the terminals are staggered to facilitate wiring.

The push-button actuator also forms a self-contained unit, as indicated at C in Fig. 2. Buttons are available in red, green, yellow, black and white, and, to ensure oil-tightness, a sealing diaphragm is fitted behind the button, which is made from a special grade of neoprene in order that it will remain permanently soft and pliable. A cross-bar is secured to the end of the button stem, and transmits thrust to the two cone-pointed plungers of the associated contact block. The seating gasket D maintains an oil-tight seal between the button housing and the panel on which it is mounted, and the locking ring E is provided with six drain slots. Legend plates, as indicated at F, are available in three sizes, with an extensive standard range of identifying wording arrangements, in silver lettering on black or red grounds, and blank plates with black or red grounds only can be supplied, whereon special wording can be engraved. Four different designs of button can be incorporated, two of which are of plastic and two of aluminium. A standard button is shown in Fig. 1 and 2, and there are also long, mushroom-head and palm-operated buttons. Long buttons are available in black and red, and mushroom and palm-operated buttons in red and

green, only, the diameters of the heads for the latter types being 1½ and 2¼ in., respectively.

In addition to the push-button assemblies mentioned, there are other types of operating units, which are used with standard contact blocks, either singly or in stacks. At the right in Fig. 1 is shown a Roto-push unit which combines the functions of a push-button and a selector switch. The operating button is surrounded by a serrated collar with a sunk and filled indicating line. Any one of two or three circuits can be selected by turning the collar to the appropriate position, and the circuit is then energized by depressing the button.

Other types of selector switches, as seen in Fig. 3, are of the knob- or key-operated type. Each type, also the Roto-push unit already mentioned, incorporates a cam which depresses the contact plungers of the blocks in the required sequence. Selector switches are available in two- or three-position types, with spring-return of the knob or key to the central position of the three-

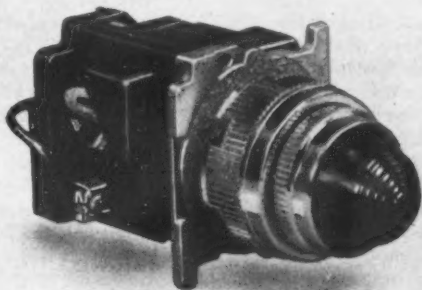


Fig. 4. A Pretest Indicating Lamp with a Resistor for Reducing the Voltage. The Bulb can be Tested at any Time by Pressing the Lens

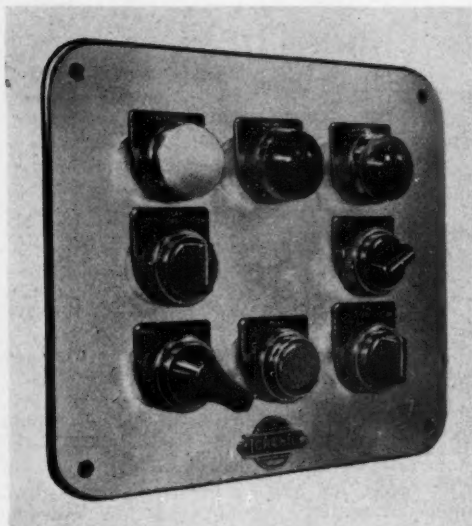


Fig. 5. A Typical Panel with Units from the New Range. At the Top are Standard Indicating Lamps, with Two Selector Switches Below. The Bottom Row Comprises a Lever-actuated Selector Switch, a Standard Push-button, and a Knob-actuated Selector Switch

position units, if desired. Key-operated units can be arranged so that the key can be removed only in any one of a variety of settings.

Two types of indicating lamps are included in the new range, both of which are of compact design, with a resistor or transformer for reduced-voltage power supply. The standard lamp has a rounded glass lens, which is visible from any angle in front of the panel. Lenses are available in clear glass and five colours, namely, red, green, amber, blue and white. The other type of lamp is known as the Prestest, and is shown in Fig. 4. With this design, the bulb can be checked, simply and quickly, without disturbing the control circuit, or removing the bulb or lens, by pressing the lens inwards. A single-pole, double-throw, momentary-contact switch is built into the unit, and the back-of-panel space for the transformer type is 1 1/8 in., and for the resistor type, 1 1/4 in. In the normally-closed position, the switch connects the lamp unit with the main control circuit, and in the open position, the unit is connected to a separate, constantly-energized, momentary-contact circuit. Legend plates in three sizes, with various standard wording arrangements, are available.

The standard oil-tight enclosures for the new range of control units include covers and boxes to accommodate 1, 2, 3, 4, 6, 9, 12 and 16 push-buttons or other switches. Cast from aluminium alloy, the enclosures are available in deep and shallow designs, arranged either for one-hole or base mounting. Sealing against oil or moisture is by a cork-neoprene gasket.

A representative switch panel incorporating some of the new push-buttons and other units is shown in Fig. 5, and the neat appearance may be observed. A row of standard indicating lamps may be seen at the top of the panel, with two knob-actuated selector switches below. In the bottom row, there is a standard push button, and two further selector switches. The left-hand selector switch has an operating lever in place of the usual knob.

Accessories that can be supplied for use with the new Igranit control gear system include an interlocking attachment for use with a pair of push-button operators and one contact block, a padlock attachment for locking normally-closed contacts in the open position to prevent accidental operation of the push-button, a selector switch locking attachment, and a "wobble-stick" actuator for emergency operation of a push-button.

TECALEMIT NYLON TUBING.—A new range of nylon tubing has been introduced by Tecalemit, Ltd., Plymouth, Devon, which is claimed to combine the advantages of comparatively low cost, lightness, toughness, and resistance to heat and ultra-violet light. This tubing, which is extruded to close limits, is also resistant to oil, grease, and many chemicals, and may be employed, for example, for lubrication, hydraulic control, air, fuel, vacuum and coolant lines. Apart from its relative cheapness, the tubing does not require to be pre-formed, and it is stated that installation costs can be reduced, in consequence, by as much as 50 per cent. It is also reported that when nylon is substituted for metal tubing, the weight of an automatic chassis lubrication system for a passenger vehicle can be reduced by as much as 45 lb.

The tubing is made in semi-rigid and flexible types, and the former can be supplied in high and low pressure grades with outside diameters from 1/8 to 1/2 in. High pressure tubing has a short-time bursting-pressure rating of 2,500 lb. per sq. in. Flexible tubing is normally supplied with outside diameters of 1/8 and 1/4 in.

Ranges of solderless pipe fittings for use with the semi-rigid tubing, and of end fittings for the flexible tubing, are available.

The Fifth Gauge and Tool Exhibition—2

Coventry Gauge & Tool Co., Ltd., Fletchamstead Highway, Coventry. Stand No. 57

In addition to the Matrix machine for checking gears for tooth spacing and concentricity, and the high precision comparator, which were described in *MACHINERY*, 92/1074—9/5/58, new developments exhibited by this company include the involute checking machine shown in Fig. 1, and the circular tilting work table in Fig. 2.

The involute measuring machine will handle helical and spur gears up to 12 in. diameter, with integral shafts up to 24 in. long, and can be supplied with a Taylor, Taylor & Hobson high magnification recording unit, as shown, or a Lowne sensitive indicator. A work-table may be fitted for mounting internal gears, which are checked for involute form with the aid of a special stylus attachment for the measuring head.

Rotation of the work is effected by a straight edge, which is attached to a handwheel-operated

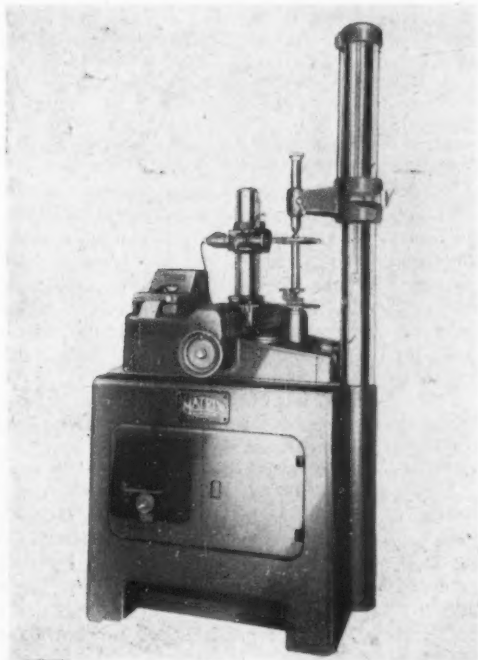


Fig. 1. Matrix Involute Checking Machine

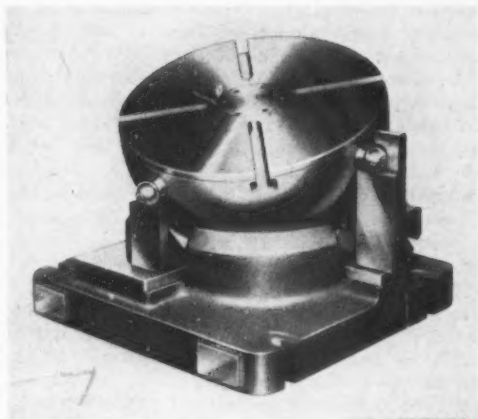


Fig. 2. Matrix 9-in. Diameter Tilting Work Table for Setting Compound Angles

cross-slide and is held, by means of a weight, in contact with the periphery of a base-circle disc fixed to the spindle. A small variable-speed gearbox is incorporated in the drive, which enables the ratio between the movement of the slide and the feed of the paper strip on the recorder to be varied, so that 3-in. long graphs may be produced for gears with different tooth depths within the capacity of the machine. There is also a built-in free-wheel mechanism which ensures that the paper strip is held stationary during the return movement of the slide. The measuring head may be indexed through 180 deg., so that the stylus pin can be brought into contact with opposite flanks of gear teeth, and intermediate adjustments can be made accurately, with reference to a circular scale, for setting in accordance with the helix angle of the gear.

Intended for accurate setting of single or compound angles up to 45 deg., the 9-in. diameter tilting work-table is noteworthy for the fact that the upper portion is of hemi-spherical form, and can be swivelled in a conical seating in the base. With this design, the overall height is fairly low when the table is set to a compound angle.

For setting the T-slotted working surface horizontal, slip gauge combinations of 3-7500 in. are interposed between reference surfaces on the base and two ball-ended pins at 90 deg.

which extend from the spherical portion. The distance between the axis of the table and the centre of the ball pins is 5 in. A detachable setting piece with a vertical reference surface is provided for use in conjunction with one of the ball pins, to ensure that the table is tilted in either direction accurately in relation to two datum pads on one edge of the base.

A central bolt with a spherical head, and a nut which is tightened by means of a spanner passed through a slot in the base at the rear, are provided for clamping the table. Since the mating hemispherical and conical surfaces give a wedging action, only light pressure need be applied by the bolt and nut for securing the table. Settings can be made to an accuracy within 10 sec. of arc, and the table can be employed for inspection, also for grinding and jig boring operations.

A new 3-dimensional measuring machine on view is of similar design to the company's Matrix No. 59 jig borer, except that the spindle, which runs in pre-loaded ball bushes, can be rotated freely by hand only, and is set vertically, to a high degree of accuracy, by means of an optical scale. Intended primarily for checking holes for position, the machine is equipped with a Taylor, Taylor & Hobson recording unit.

As on the jig borer, the 18-by 12 in. T-slotted table has a longitudinal travel of 12 in. and a cross-movement of 8 in., and settings to an accuracy of 0.0001 in. are obtained by leadscrews and corrector bars, in conjunction with vernier scales. Rapid power traverses at the rate of 32 in. per min. are provided by motor-drives to facilitate coarse setting. A separate motor-drive gives rapid power adjustment of the column vertically at the rate of 19 in. per min., and a maximum distance of 22½ in. is obtainable between the spindle nose and the working surface of the table.

The display also includes a selection of plug and ring gauges treated by the recently-developed Cromatrix hard-chromium-plating process, which was the subject of an article in *MACHINERY*, 92/573—7/3/58.

Birmingham Tool & Gauge Co., Ltd., Soho Hill, Handsworth, Birmingham, 19. Stand No. 11

A wide range of small tools, cutters, and gauges is being shown on this stand, including the new B.T.G. gun reamer shown in Fig. 3. This reamer is made from 4 per cent nickel-chrome-molybdenum steel, heat-treated to 100 tons per sq. in., and is provided with a cutting blade and rubbing pads of tungsten carbide. The pads provide a burnishing action which is said to impart a very high finish to the hole, and the carbide cutting tip is of large section, to reduce the tendency for the edge to chip

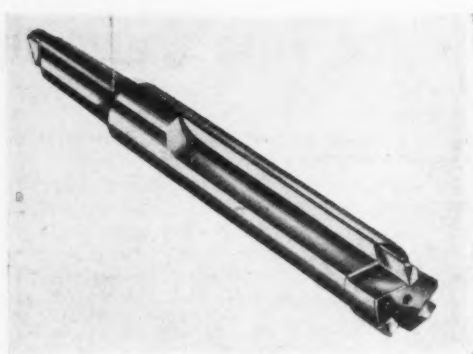


Fig. 3. The Birmingham Tool & Gauge Gun Reamer

when the reamer is being used on high tensile steels.

It is claimed that this reamer, which is arranged for end-cutting, so that there is no tendency to follow the previously-drilled hole, will give production rates on high-tensile and stainless-steel which are 50/60 times as great as those obtainable with conventional tools. The reamers are available in a variety of sizes, with taper or parallel shanks, and can also be supplied with shanks made to customers' individual requirements.

Leytonstone Jig & Tool Co., Ltd., Leytool Works, High Road, Leyton, London, E.10. Stand No. 2

In addition to a comprehensive selection of precision jigs, fixtures, press tools and special-purpose machinery, this company are showing complete sub-assemblies for aircraft, and a number of components which have been machined to very close limits. The full range of Leytool precision hand-tools are displayed, including hand- and breast-drills, ratchet spanners, and the micro-divider setting gauge.

This company has recently developed a 2-in. stroke, slotting machine arranged for bench mounting, which is available in two versions. The Mark I unit, for toolroom use, has a transverse table movement of 6½ in., and a lateral table movement of 6½ in. Power feed can be applied to both these traverse-motions, in increments of 0.0025 in. per stroke, and a 7-in. diameter rotary table is incorporated, for which power feed is also available.

The Mark II machine is intended for workshop use, and is similar in most respects to the Mark I, except that a rotary table is not provided, and the lateral and transverse movements of the table are

hand-operated. Both machines can be employed at speeds up to a maximum of 304 strokes per min. It is stated that, with the provision of suitable jigs or fixtures, these machines are particularly suitable for operation by semi-skilled or unskilled labour, after only a brief training period.

F. Burnerd & Co., Ltd., 5 Balfour Place, Park Lane, London, W.1. Stand No. 126 (Gallery)

The design and method of operation of the Burnerd Multi-size key-operated collet chuck and collet were described in *MACHINERY*, 92/148—17/1/58, and a comprehensive range of these units is being exhibited for the first time. With this design of collet, the work is gripped by a number of narrow wedge-shaped blades, and a uniform gripping pressure can be applied, over the full length of the blades, to workpieces which vary as much as $\frac{1}{2}$ in. from the nominal gripping size of the collet bore. It is stated that workpieces are held concentric within 0.0005 in., at a distance of 4 in. from the collet nose, and that the large gripping force applied enables heavy cuts to be taken without risk of slip or vibration. A total of only 11 Multi-size collets is required to accommodate workpieces from $\frac{1}{8}$ to $1\frac{1}{2}$ in. diameter. An adjustable stop is available for use with these collets, to provide for endwise location of the work.

Chuck bodies with different mounting arrangements are available, including those to suit lathes with American type A1, type D1 cam-lock, and type L long-taper noses.

The company's 3- and 6-jaw Griptru self-centring chucks incorporate an adjustment which enables a part to be set concentric within 0.0002 in., total indicator reading. Other types of chucks being shown on this stand include conventional 3-jaw self-centring, 4-jaw independent, lever scroll, and high precision instrument makers' chucks.

O-Vee Spring Gauges, Ltd., 1 St. Kilda's Road, Harrow, Middx. Stand No. 145 (Gallery)

The O-Vee screw thread comparator, which is designed to measure the effective diameter of a thread form, was described in *MACHINERY*, 90/1291—7/6/57, and three versions of this instrument are being displayed. The No. 1 size is suitable for the range of B.A. threads, the No. 2 size, for general purpose work, and the No. 3, for larger threaded pieces, up to a diameter of 2½ in.

The gauging elements of this comparator consist of two helical coils of wire, of a diameter and pitch to suit the thread to be measured, which are carried on a pair of parallel bars. Owing to their flexibility, the wire coils adjust themselves

accurately to the thread pitch, and they are mounted on the ends of the bars in such a manner that they can rotate freely. One of these bars is provided with a screw adjustment, so that it can be set in position, and the other, which is sensitively balanced, is free to move. Movement of this member is transmitted and magnified, through a gear and lever system, so that readings can be obtained from a pointer and graduated scale.

The full range of O-Vee thread measuring gauges is also being exhibited, covering sizes from 10 B.A. up to a maximum of 6 in., effective diameter. These gauges can be supplied for Whitworth, B.S.F., B.S.P., and B.A. threads, also Unified, Metric, American, and special 2-start forms.

W. H. Marley & Co., Ltd., New Southgate Works, 105 High Road, London, N.11. Stand No. 139 (Gallery)

The full range of Marlico machine tool equipment is being shown, including all-purpose collet chucks, angle collet fixtures, and the newly-introduced range of Multibore collets and back stops. As may be seen in Fig. 4, this collet comprises a number of segments, each of which is separated by a U-shaped spring, and the entire assembly is retained by means of two square-section circlips. As the collet closes, the U-shaped springs are compressed, and the ends of the circlips slide past each other, with an overlapping action. The back-stop, which is secured in position on the Marlico work-holding attachment by means of three screws, has a cone-piece which engages with a chamfer at the rear of the collet bore. Axial movement of this cone, to bring it into position, is obtained, by an adjusting screw, and a clamp is provided which locks the screw but leaves the cone free to rotate with the collet. This arrangement ensures that the collet segments cannot collapse at the rear when short workpieces are being held. It may be noted that this backstop can also be used with the com-

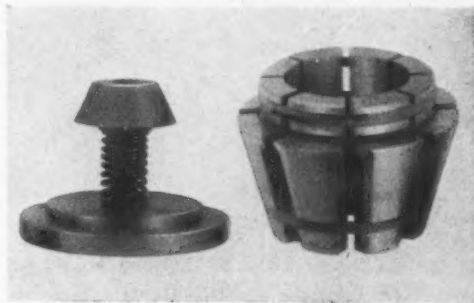


Fig. 4. Marlico Multibore Collet and Back Stop

pany's pad-type collets. Multibore collets are available for diameters from $\frac{1}{4}$ to $1\frac{1}{2}$ in., and each will accommodate diameter variations up to $\frac{1}{8}$ in.

Marlco keyway broaches are on view, including two recently-introduced sets for keyway sizes at each end of the former range. The No. 0 set covers keyway widths of $\frac{1}{16}$, $\frac{3}{32}$, and $\frac{1}{8}$ in., in bores with diameters from $\frac{1}{4}$ to $\frac{1}{2}$ in., and the No. 3 set, widths of $\frac{3}{8}$ and $\frac{1}{2}$ in. in bores from 2 to $3\frac{1}{4}$ in. Broaching with both push- and pull-type tools is being demonstrated on a Marlco hydraulic press, also deep-drawing and cold-hobbing operations. It may be noted that this company specializes in the manufacture of wave guide broaches for use in the radar industry.

Attention may also be drawn to the Equimaster spacing attachment, for the accurate drilling of equally-spaced holes on pitch circle diameters up to 7 in. Also shown on this stand is the Marlco thread measuring comparator, which, in conjunction with thread measuring parallels and a dial indicator type snap gauge, provides for checking the effective diameters of screw threads on a production basis.

Mercer & Garside, Ltd., Mergar Tool Works, Watt Road, Hillington, Glasgow, S.W.2. Stand No. 149 (Gallery)

The large screw plug gauges seen in Fig. 5 are being displayed as representative of the company's products in this field. These gauges, for checking threads in the bodies of wedge-type gate valves, are made in a range of sizes up to a maximum of 14 in. diameter. The main exhibit is a selection of standard and special ground thread taps, and in the latter category may be noted bent-shank taps for automatic nut tapping machines, also boiler stay, Acme, and interrupted-

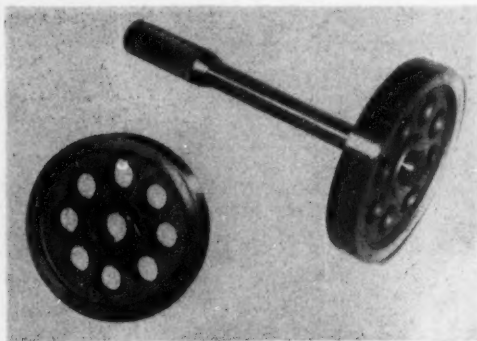


Fig. 5. Mercer & Garside Large Screw Plug Gauges for Checking Gate-valve Bodies

thread types, together with hand taps of various forms and pitches ground on standard blanks.

In addition, the firm's exhibits include high carbon/chrome and high-speed steel thread rolling dies, and examples of precision thread ground parts which have been produced for customers.

Holt & Mosedale, Ltd., Holdale Works Helena Street, Smethwick, 40, Staffs. Stand No. 118

The principal exhibit on this stand is the company's spray lubricating equipment for the dies of forging and drawing presses. This equipment,

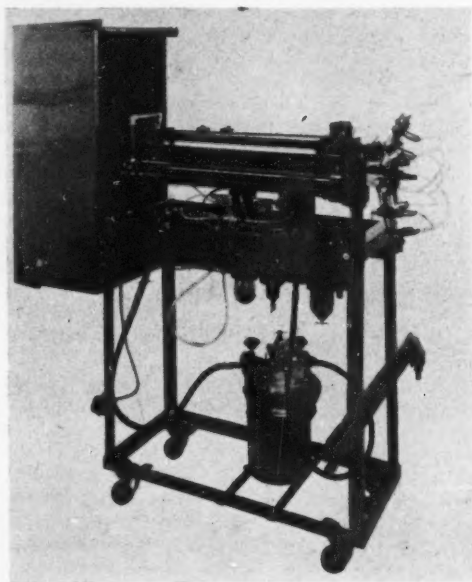


Fig. 6. Holt & Mosedale Spray Lubricating Equipment for Forging and Drawing Dies

which is shown in its latest form in Fig. 6, comprises a twin-nozzle spraying head here seen in the retracted position which is arranged for spraying upwards and downwards, and is carried on the end of the piston rod of a double-acting air cylinder. Control of the piston is effected by means of push-buttons, which are interlocked electrically with the press so that the spraying head can be extended only when the ram is in the raised position, and the ram cannot be lowered if the head is in operation. The lubricant container, and the necessary valves, filters, and regulators, are mounted on the trolley, to provide a self-contained unit, and there are

adjustments for controlling the form, duration, and volume of the spray. In this way, the quantity and distribution of the lubricant can be accurately predetermined, and it is claimed that economies can thus be effected, and production rates are increased.

Examples of the jigs, tools, fixtures, gauges, moulds, and dies made by this firm are also being shown.

Shirley Tools & Engineering, Ltd., 1-3 Elgin Road, Freemantle, Southampton. Stand No. 115 (Gallery)

A representative selection from the range of press tools, moulds, and jigs made by this firm is being shown, together with a display of various component parts, and photographs of tools, which have been made for the aircraft, motor-car, and other industries.

Shardlow Micrometers, Ltd., P.O. Box 62, 350 Petre Street, Sheffield, 4. Stand No. 104 (Gallery)

In Fig. 7 is shown the Shardlow micrometer with oblique graduations on the measuring sleeve. With this instrument, it is impossible for any reference line on the sleeve to be completely obscured by the end of the thimble. In consequence, the possibility of making an error of 0.025 in. in the reading, that is, the equivalent of one complete revolution of the thimble, is virtually eliminated. As can be seen from the figure, this instrument now incorporates a lever-type spindle lock, which is more readily accessible than the previous design.

Also exhibited on this stand are a number of the company's height gauges, the graduated surfaces of which have a matte-chromium-plated



Fig. 7. Shardlow Micrometer with Oblique Graduations on the Measuring Sleeve

finish. This feature, in conjunction with the flush-fitting beam, is effective in the elimination of parallax errors.

Benson Verniers, Ltd., Carlton Works, Carlton Street, Bradford, 7. Stand No. 117 (Gallery)

The vernier height gauge seen in Fig. 8 incorporates a triangular-section tubular column, and a roller-type fine adjustment for the cursor, which is the subject of a patent application. This adjustment is obtained by rotating a knurled knob, part of which can be seen projecting at the rear, whence the drive is transmitted to a number of rollers which engage with a serrated rack attached to the beam. For initial hand-setting, this fine adjustment drive can be disengaged by depressing the finger piece seen at the left, and the slide can then be moved freely along the beam.

This company's vernier calipers, which cover a measuring range from 6 to 12 in., are now fitted with larger, clear-reading verniers, and incorporate scales graduated in 0.050-in. and 1-mm. divisions. It may be noted that the range of reference-type verniers has now been extended to include 40-, 80-, and 120-in. sizes.

Other exhibits on this firm's stand include vernier depth gauges, gear tooth verniers, rolling-mill gauges, die-makers' squares, and steel beam trammels.

Windley Bros., Ltd., Crown Works, Chelmsford. Stand No. 101 (Gallery)

Inspection and measuring equipment that is being exhibited by this company includes the magnetic chuck seen in Fig. 9, which is trunnion-mounted, and is particularly intended for use when grinding broaches. In addition to the swivelling

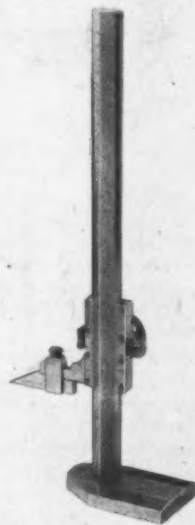


Fig. 8. Benson Height Gauge with Patented Roller-type Fine Adjustment

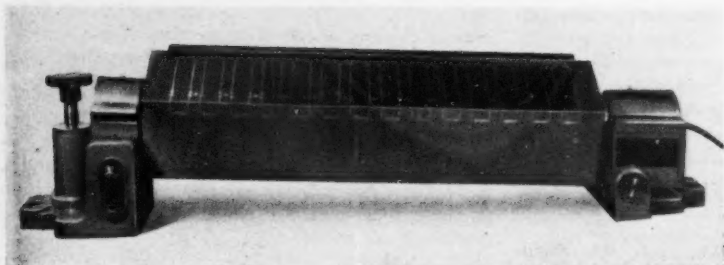


Fig. 9. Windley Swivelling and Tilting Magnetic Chuck for Broach Grinding

action, a tilting movement is provided, the right-hand trunnion housing being carried on a horizontal shaft fixed in the mounting foot. The left-hand foot incorporates an adjusting screw for the tilting movement, and the table can be locked at the required angle by means of the stud and nut seen projecting through the vertical slot at the left. An open-ended slot is provided in each mounting foot, so that the chuck may be secured to the machine table.

A non-electric magnetic compound sine table is being shown. This table, which has a working surface of 10 in. by 5 in., can be used for grinding both simple and compound angles. It is stated to be accurate to within 0.2 min. of arc. In addition, a range of demagnetizing equipment is being displayed.

As representative of the range of inspection equipment, there are black Swedish granite surface plates, surface tables, angle plates, and straight edges.

Purfection Engineering Co. (Coleshill), Ltd., Station Road, Coleshill, Nr. Birmingham. Stand No. 120 (Gallery)

This company are showing spline gauges of all types, ranging from an involute spline ring of 11-in. diameter, to a similar type of gauge with a pitch circle diameter of only 0.156 in. and 21 involute form teeth. In addition to these items, a selection of precision form-ground gauges and tools is on view.

Solex (Gauges), Ltd., 72 High Road, Chiswick, W.4. Stand No. 157 (Gallery)

In Fig. 10 can be seen a new leak meter which has been developed to facilitate the detection of very small leaks, such as may be present in cylinder and piston assemblies, for example. This instrument is capable of recording leaks that would otherwise remain unobserved, and has been applied

to such mechanisms as slide valves, injectors, needle-operated cut-off devices, also for detecting porosity in castings.

Examples of air-operated gauging equipment, for both single and multi-dimensional sizing applications, are being demonstrated. The company's standard air controller has recently been re-designed, and is now of a more

compact form. The Solex basic principle of operation remains unchanged, but the overall height has been reduced by approximately 6 in., and the gauge connection is now located at the base of the unit.

The comparators, for workshop and standards room use, that are being exhibited include external types, with magnifications ranging from 4,000:1 to 23,000:1, complete with a full range of accessories, including a special slip checking table. The standard internal comparator has four interchangeable measuring bodies, covering a range of sizes from 0.118 to 6 in. This instrument is particularly suitable for the measurement of reference rings, and all bores where a high degree of accuracy is required.

The plug gauges produced by this company are divided into two basic types, namely the air-jet plug and the contact plug. The latter, which is fitted with tungsten-carbide anvils, makes direct contact with the surface of the bore, one anvil being fixed and the other free to move. The measuring range for air-jet plugs is from 0.118 in. diameter upwards, and for contact plugs, 0.236 in. diameter upwards.

A 3-dimensional gauging set-up for checking the diameters of rear axle pinion bearings is on view, which incorporates light signals to indicate when the high and

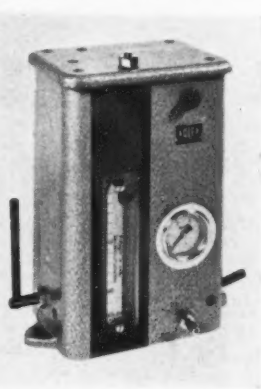


Fig. 10. Solex Leak Meter for the Detection of Very Small Leaks

low limits have been exceeded. A 24-column multi-gauging cabinet for checking crankshafts is being displayed, and an unusual feature of this set-up is that, since the gauges are mounted in a common installation, single or double-throw components can be handled.

Among the extensive selection of standard parts may be noted, adjustable C-gauges for external measurement, fitted with shock-proof measuring heads; hand and snap gauges; sphereometers; extensometers; and caliper grinding gauges. Also on view is a newly-developed chart recorder which provides a record of variations in size.

Reliance Precision Tools Ltd., The Causeway, Staines, Middlesex. Stand No. 8

Examples of the various types of cutting tools, in the production of which the company specializes, are being displayed on this stand. A Churchill-Cleveland hobbing machine, set-up for cutting gears and splined shafts for a motor-car gearbox, is being demonstrated. The gearbox, sectioned to reveal the internal arrangement, is also on view. In addition, two Victoria milling machines are being shown set-up with cutters made by the company for performing operations on coal cutting boxes.

Precision Grinding, Ltd., Mill Green Road, Mitcham Junction, Surrey. Stand No. 3

The exhibits on this stand afford an indication of some of the many applications of the company's Profiloscope and Projectorscope optical equipment in connection with the machining of intricate workpieces to close dimensional tolerances.

The Profiloscope unit may be employed on surface and cylindrical grinders to facilitate operations on forms with combined radii and angular surfaces. An important advantage of the equipment is that it permits the form to be controlled while grinding is in progress, so that the need for removing the work from the machine, and transferring it to a projector for subsequent inspection, is obviated.

The unit also enables the movement of slides on machine-tools to be closely controlled, without reference to scales, so that different portions of the form of the work can accurately be positioned in relation to each other. In addition, the equipment enables the grinding wheel shape to be

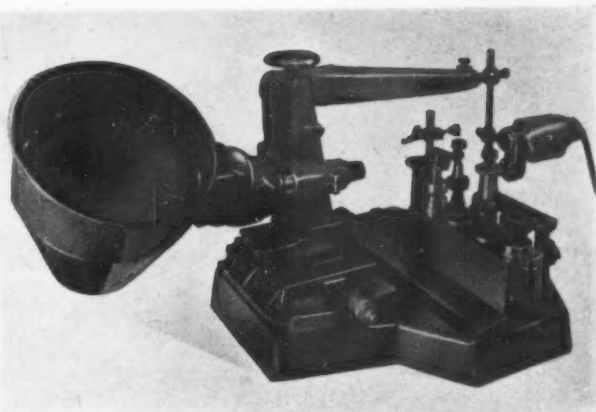


Fig. 11. The "Precision Grinding" Projectorscope Optical Equipment is Here Shown Set Up for Checking End Mills for Nose Radius and Run Out

checked readily when dressing has been performed.

The Projectorscope is of similar design to the Profiloscope, with the principal exception that a circular screen, instead of an eyepiece, is provided for viewing a magnified image of the work. This equipment affords a convenient means of controlling the saddle and cross-slide movements of a lathe when copy turning of very small parts, and certain intricate internal shapes, is being undertaken. For these operations, a master graticule is mounted in a holder which is attached to the bed of the lathe, and the Projectorscope unit is fixed to the cross-slide. While turning is in progress, the cross-slide and saddle are adjusted so as to maintain cross lines at the centre of the screen, coincident with a magnified image of the graticule lines.

In Fig. 11, the Projectorscope is shown set up for checking end mills employed for the production of turbine blades for nose radius and run-out. The unit and its associated compound slide are mounted on a base, which carries a sliding block fitted with adapters to take the end mills to be inspected. In use, the cutters are brought to the inspection position, and magnified images of their nose ends are projected optically on to the screen of the Projectorscope for comparison with standard graticules.

The universal measuring machine, which is being exhibited at the Gauge and Tool Exhibition for the first time, was fully described in MACHINERY, 86/1207—3/6/57. It may be employed for a wide variety of precision inspection duties, such as checking 3-dimensional and plate-

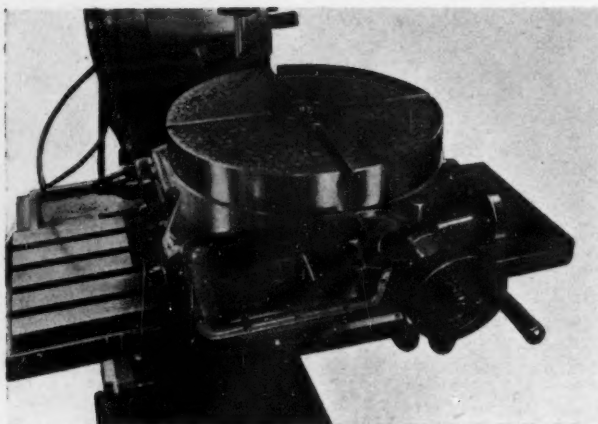


Fig. 12. "Precision Grinding" 12-in. Diameter Optical Rotary Table

type cams, splines, screw threads, and gears for tooth spacing and concentricity. An optical dividing head, which will give readings to 6 sec. of arc, and a tailstock, are mounted on a T-slotted surface at the front of the bed. Supported by ball bearings on guideways at the rear is an optical measuring head which will indicate vertical movements of the stylus pin to within 0.00005 in., and can be positioned longitudinally to the same order of accuracy for length measurement.

The dividing head can be used separately, and a sine-bar base is available, which can be set accurately for angle, with the aid of slip gauges, for tilting the head when taper parts are to be checked.

Also shown at the Gauge and Tool exhibition for the first time is the 12-in. diameter optical rotary table illustrated in Fig. 12, which has been developed from the company's dividing head.

Peter Brasshouse, Ltd., Spring Hill, Birmingham, 18. Stand No. 34

Two examples of Drillmax special-purpose machines are demonstrated in operation, one of which, comprising six unit heads and an automatic indexing table, can be seen performing a number of operations on motor car water pump bodies. The second machine, consisting of three unit heads, is intended for machining light-alloy windscreen wiper bodies. From the range of Drillmax automatic screw-feed unit heads, the types I, S2, S5, and S15 are on view, and working demonstrations of the 16- and 36-in. Drillmax automatic indexing tables are being given.

A number of special multi-spindle drill heads, assembled from the company's standard range of drilling spindles, gears, and other parts, can be seen, in conjunction with examples from the M and V series of multi-spindle heads, of the adjustable-centre type.

A number of press tools, taken from the firm's production line for the duration of the exhibition, are being displayed, together with their respective finished workpieces. Examples of intricate jigs and fixtures, and a photographic display, are used to indicate the scope of the company's activities in this field.

It may be noted that the Peter Brasshouse works situated at Aldridge, Staffs., has lifting equipment capable of handling any single piece up to a maximum weight of 10 tons.

Desoutter Bros., The Hyde, Hendon, London, N.W.9. Stand No. 6

On this stand can be seen a selection from the wide range of die sets made by this company, including rear-, diagonal-, and centre-pillar, and circular types. Attention is drawn to a number of die sets which have been made specially for the instrument and watch-making industries, and to the latest 4-pillar die set seen in the accompanying Fig. 13. This design is particularly recommended for those applications in which extra rigidity is required.

The punch holders and die bases are of high-grade cast iron, and are accurately machined and ground to ensure interchangeability. Pillars and bushes are of case-hardening steel, ground to close limits, and oil reservoirs provide lubrication.

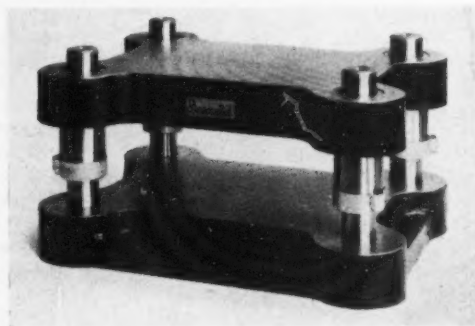


Fig. 13. Desoutter 4-pillar Die Set

This company has produced a series of full-scale, printed, outline drawings covering the majority of their standardized die sets, and complete sets may be obtained from the stand, or on application to the Die Set Division, 121 Hay Lane, Kingsbury, N.W.9.

Essex Tool & Gauge Co., Ltd., Navigation Road, Altrincham, Cheshire. Stand No. 133 (Gallery)

This company is showing a wide range of gauging and measuring equipment, including double-ended and reference plug gauges, ring gauges, and a comprehensive selection of sine bars and sine plates. Sets of standard and ball-ended test bars are being displayed, also receiver and concentricity gauges, and a square-checking fixture. Among other items on view may be noted a number of offset boring heads, a trunnion-mounted fixture, and a torque-test fixture.

Firth Brown Tools, Ltd., Speedicut Works, Carlisle Street East (P.O. Box No. 59), Sheffield, 4. Stand No. 43

The patented Speedicut high-rake side and face cutter, with chip controller, seen in the accompanying Fig. 14, has been designed specifically to overcome difficulties associated with chip disposal, and can be used for both conventional and climb milling. It is claimed that cutters of this design can be used for operations which normally would be considered unsuitable for high-rake milling. The chip-controller increases the strength of the tooth, without the need for reducing the high radial rake angle, and produces a short, close-curved chip which can readily be contained within the gullet,

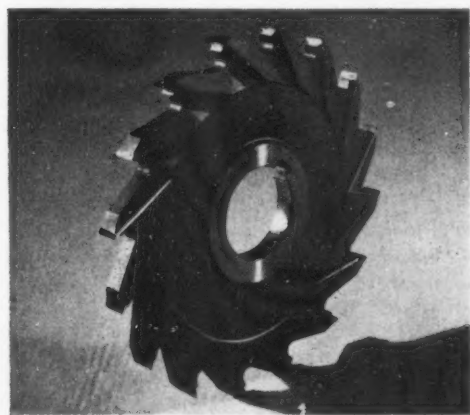


Fig. 14. Firth Brown Patented Speedicut High-rake Side and Face Cutter with Chip Controller

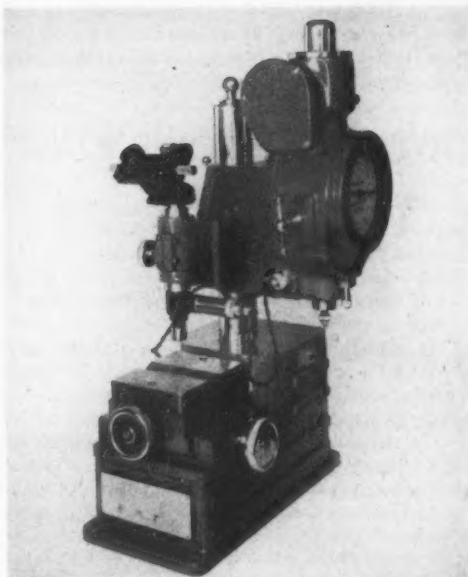


Fig. 15. New Firth Brown Hardometer Hardness Testing Machine with Micrometer Eyepiece

so that the cutter is particularly suitable for deep slot milling. Swarf is freely ejected as the teeth leave the workpiece, and it is stated that slots which, hitherto, have required several passes, can usually be completed at a single pass, and that a high surface finish is obtained.

Tests have shown that these cutters can be used successfully for machining a wide range of materials, including titanium, but it is emphasized that a copious supply of coolant must be provided, especially around the contact area of the cutter and the work, both before and during cutting.

The new Hardometer hardness testing machine seen in Fig. 15 has recently been added to the company's range. The measuring microscope, which is of the metallurgical type, incorporates a micrometer eyepiece so that impressions can be measured to an accuracy of 0.001 mm., and there is provision for measuring the diagonals in both directions. This microscope is mounted on a ball bearing slide, and a fine adjustment is provided for bringing the image of the impression into focus.

A 3-figure counter is incorporated in the microscope eyepiece from which the size of the impression can be read directly, the number registered on this counter representing the diagonal in

units of 0.001 mm. The equivalent hardness reading is then obtained by reference to the appropriate table contained in an instruction manual supplied with the machine.

Tolimit Gauges, Ltd., 16 Peterborough Road, London, S.W.6. Stand No. 1

It is announced that, in conjunction with the Coventry Gauge & Tool Co., Ltd., the latter company's Matrix 1A grinding machines have now been developed to incorporate automatic size control by means of the Tolimit air-electronic gauge. Two of these machines are being demonstrated on this stand, one set up for plain cylindrical grinding, to a high degree of accuracy, and the other arranged for grinding shafts to match the bores of mating components to a predetermined fit. The Tolimit air-electronic gauge, which was described in MACHINERY, 91/209-26/7/57, incorporates photo-transistors, actuated by the liquid in the air gauge column, and it is stated that this system, at the standard magnification of 5,000:1, is accurate to within 0.000006 in.

The equipment seen in Fig. 16 is a cabinet-mounted Tolimit gauge and dual-jet air plug for

checking a liner bore and counterbore, of 5 and 6 in. diameter respectively, in a cylinder block casting.

In addition to the machines already mentioned, an automatic gauging and grading machine fitted with the Tolimit air-electronic gauge is being shown, and it may be noted that a range of these gauges is also available, which is suitable for manual operation. A number of individual set-ups, using this gauging system, will be demonstrated, including both the single- and multi-column types, and attention is drawn to a jet-plug set-up which, in conjunction with a magnification of 50,000:1, will be employed to demonstrate the accuracy and uniformity of Tolimit setting rings.

This company are now applying a new precision micro-chrome treatment to their standard range of gauges, and the products exhibited which have been treated by this technique, include plain and screw plug and ring gauges, plain and thread calipers, master setting discs and rings, and thread measuring cylinders.

The new designs of external and internal thread comparators incorporate interchangeable anvils covering a wide range of threads, and it may be noted that these instruments can be supplied either with dial indicators or arranged for use with the Tolimit 130 liquid-column air gauge.

Engineering Products, Ltd., Littlerts Close, Merton Abbey, London, S.W.19. Stand No. 134 (Gallery)

Oldak dial indicators, cylinder gauges, comparators, grinding gauges, universal test sets, and thickness gauges are being shown, as representative of the company's range of products.

The latest magnetic base test indicator, which was described in MACHINERY, 90/1354-14/6/57, is supplied with a "Spot-on" dial indicator, graduated in 0.0005 in. divisions, and incorporates three pot-type magnets whereby the 2-in. diameter light alloy base can be secured to a reference face.

Knurling tools and wheels are on view, also rollers and pins for roller box tools, and a selection of components that have been produced on automatic screw machines.

Clarkson (Engineers), Ltd., Nuneaton. Stand No. 14

In Fig. 17 is shown an example from the recently-introduced range of Truesize reamers, and the new Aximatic floating holder which are being displayed by this company. Available as long and short types, the reamers have high-angle right-hand spiral flutes, which are claimed to enable holes to be held to close limits of accuracy for diameter, and to ensure improved surface finish on the work. The reamers can be supplied ready

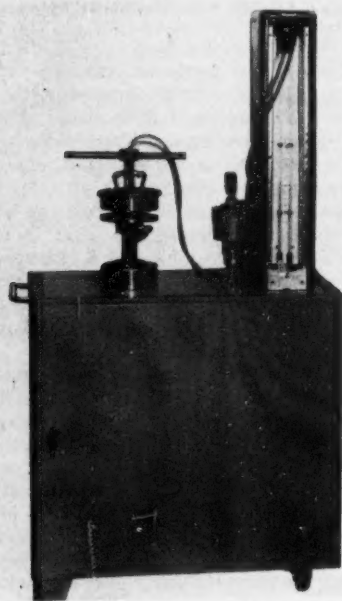


Fig. 16. Tolimit Dual-jet Air Plug Gauge for Checking a Liner Bore and a Counterbore in a Cylinder Block

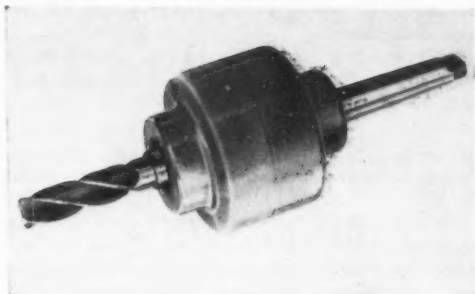


Fig. 17. One of the New Clarkson True Size Spiral Reamers and an Aximatic Floating Holder

ground for producing holes to B.S. or Newall A tolerances.

Attention may also be drawn to a "miniature" chuck which has recently been added to the firm's Dedlock range, and is particularly intended for use on light-duty milling machines. The design is such that there is only very short overhang of the cutter. Facing cutters from 1½ to 2 in. diameter which have been specially developed for use with the new chuck are on view.

A full range of Autolock and Dedlock chucks and cutters, also the company's spiral side and face cutters, are being demonstrated on two milling machines. For the demonstrations, the spindle speeds and cutting feeds are selected, with the aid of Clarkson slide rules, to enable a good surface finish to be obtained on the work, and, when cutting keyways, to provide for accurate sizing at one pass. These demonstrations afford an indication of the high rates of metal removal that can be obtained on both mild and nickel chrome steel with the spiral side and face cutters.

The display also includes examples from the extensive range of taper shanks, including Continental and American types, which can be provided for Autolock and Dedlock chucks.

Indusmond (Diamond Tools), Ltd., 4 Greville Street, London, E.C.1. Stand No. 50

Among the exhibits on this stand may be noted a recently-introduced Tibond range of impregnated diamond grinding wheels, new Budget diamond wheel dressers, and polished diamond tools for turning, screwcutting and hardness testing. The display also includes the company's Stadoil diamond lapping oil, Grind-all coolant for conventional grinding wheels, and Indusmond rock and crown coring tools. In addition, a new diamond dust collector unit, for use on grinding machines fitted with diamond impregnated wheels, is on view.

Gay's (Hampton), Ltd., Oldfield Road, Hampton, Middlesex. Stand No. 21

Among the special-purpose equipment being exhibited on this stand may be noted a 4-station drum-type indexing machine (Fig. 18) for performing preliminary machining operations on rear axle half-shaft forgings. The component, which has a flange at one end, is held in twin power-operated vices, and is loaded and unloaded at the first station. The remaining three positions provide for milling both ends of the workpiece to length, centre drilling each end, and drilling two driving peg holes in the flanged end.

Each cycle is initiated by push-button, and while machining is in progress the operator unloads the finished component, straightens and loads a fresh workpiece, and closes the vice by means of a

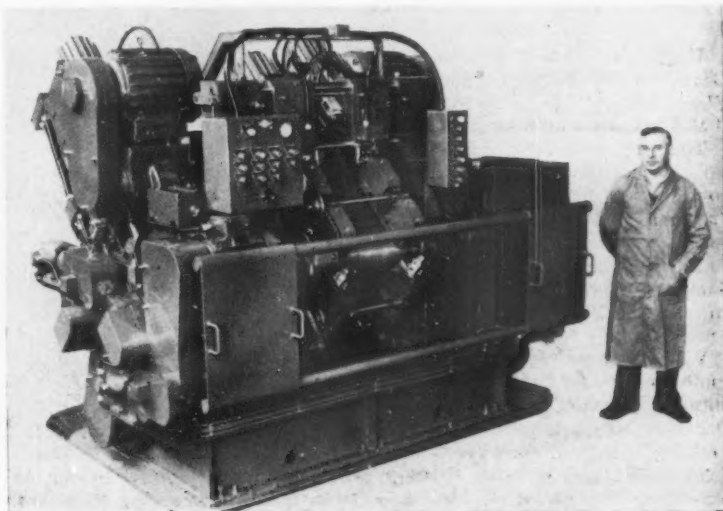


Fig. 18. Large Drum-type Indexing Machine Exhibited by Gay's (Hampton), Ltd.

second push-button. At the end of the cycle, which occupies 26 sec., the drum indexes, and the vices are automatically released to free the finished component.

The machine is fully interlocked by means of electrical relays, which are energized by limit switches actuated at the end of each mechanical movement.

B.H.P. Machine Tool Co., 91 Wattville Road, Birmingham, 21. Stand No. 22

The latest Synchrofeed press feed unit which is being shown by this company incorporates a vacuum system of new design, and a recently-developed arrangement for preventing two blanks from being accidentally fed simultaneously.

Another exhibit is the firm's Flexfeed unit, which, as was explained in MACHINERY, 91/330—9/8/57, is intended to be mounted between the bed of a power press and a combined coil cradle and stock straightener, for feeding strip material to the press tool. During the feed movement, which is derived from the straightener unit, the strip takes the form of a loop, and at each working stroke of the press, it is advanced into the tool by the spring action of the material. The height of the loop, and consequently the flexing of the strip, is maintained at a pre-set value by automatic

adjustment of the hydraulic drive system for the stock straightener.

Reference may also be made to a new scrap cutter for power presses, which will handle strip up to 12 in. wide by $\frac{1}{8}$ in. thick.

Turner Brothers (Birmingham), Ltd., Galvanic Works, Cliveland Street, Birmingham 19. Stand No. 24

The total of five power presses which is being exhibited on this stand comprises four of the ungeared, inclinable type, with capacities ranging from 6 to 30 tons, and one 70-ton geared, rigid type, with a wide ram and a Worson cushion. Each of these presses is being shown fitted with tools made by the company, and working demonstrations are being given. As representative of the wide range of components for which this company have made dies and tools, there is a selection of sample pressings, mouldings, die castings, and rubber impressions.

In the field of special-purpose machinery may be noted saw-tooth notching and tube cutting machines, also a range of tangent-bending machines, which can be supplied complete with tooling, and are particularly suitable for the production of cabinets for refrigerators, washing machines, and similar equipment, for example.

Universal Control Equipment R.M.3 Magnet Controller

Universal Control Equipment, Ltd., Queens Chambers, 61 Boldmere Road, Sutton Coldfield, Warwickshire, are manufacturing the Unicon R.M.3 magnet controller here shown.

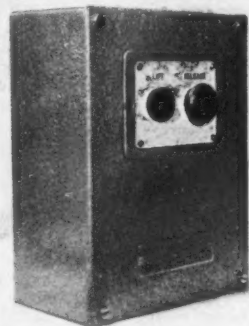
This unit is designed for 2-button manual control, or for automatic operation by means of contactors or limit switches, for example, and, in its low-current form, is suitable as an intermediate control for D.C. solenoid valves in order to overcome operational delay due to residual magnetism. Similarly, it may be used in conjunction with low-current D.C. electro-magnets, clutches, and couplings.

When arranged for high-current operation, the controller may be used in conjunction with heavy-duty contactors for large lifting magnets. Demagnetization is initiated by depression of the "release" button, and continues for a pre-determined time, a control being provided for pre-setting this period. The controller is interlocked to prevent faulty operation, and it is arranged that, under working conditions, re-

magnetization cannot be initiated until the demagnetization period is completed.

Surge suppression is effected by the use of semi-conductors. The controller is suitable for local or remote operation, and the design is such that the unit can readily be converted from one form

Universal Control
Equipment Unicon
R. M. 3 Magnet
Controller



of control to the other, by the user, on the site. Measuring 8½ by 6½ by 3½ in., the controller is housed in a sheet-steel case, and can be supplied for wall or flush fitting.

The Production of Shell Moulded Crankshafts

By J. R. VINETTE*

Turning of counterweights and drilling of pin holes have been eliminated by changing from forged to shell-mould-cast crankshafts for Erinrude outboard motors. The amount of stock to be removed from other surfaces has also been reduced, and considerable savings have been obtained because less material is required per crankshaft. The shafts, cast from SAE 4615 steel, are of uniform, closely controlled metallurgical quality.

Shell mould casting is performed in a clean, highly-mechanized foundry designed jointly by Evinrude engineers and the Link-Belt Co. A predetermined amount of screened, dry sand is discharged into a mixer from a measuring hopper at the bottom of a storage bin. An automatically

* Evinrude Motors, U.S.A.

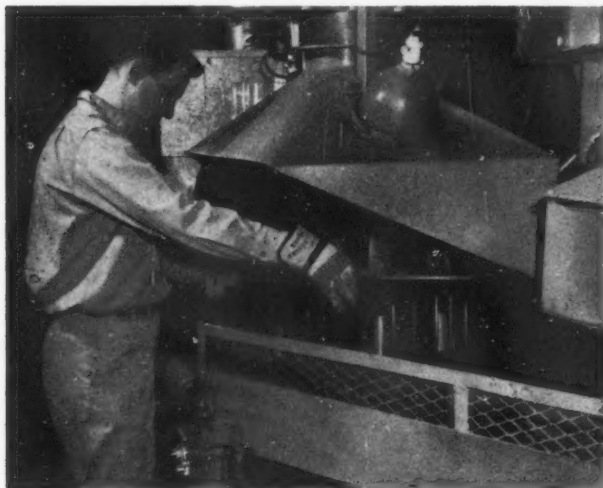


Fig. 1. The Hardened Shell Mould is Stripped from the Heated Pattern at the Ejector Station of this Automatic 4-station Mould Making Machine. The Shell Mould is Cured at the Preceding Two Stations by Electric Heaters

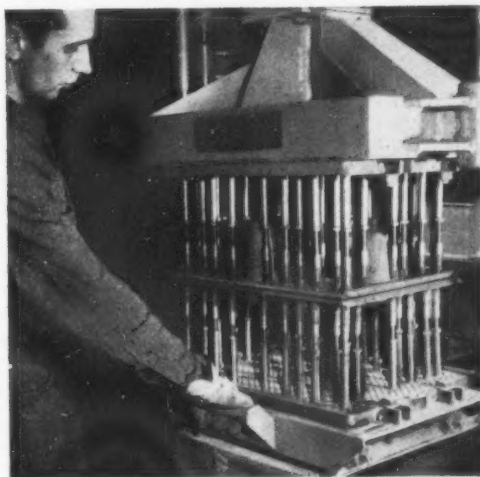


Fig. 2. Cope and Drag Components of Shell Moulds are Bonded Together with Adhesive on this Automatic Machine

weighed mixture of powdered resin and iron-oxide is then delivered to the mixer by a rotary vane feeder. Next, an alcohol-water solvent is added. Mixing is completely automatic and about 2,500 lb. of coated sand are provided per hour.

The sand is discharged on to a vibrating screen, and is conveyed pneumatically to a hopper on the shell moulding machine.

The automatic mould making machine has four stations, and can produce shells, 19½ in. wide by 29½ in. long, at the rate of 120 per hour. The four pattern frames are carried on a turntable, and each has built-in heating elements. When the heated pattern has been indexed to the investment station, a water-jacketed flask is lowered into place and filled with a measured amount of resin-coated sand. This material adheres to the pattern, and the sand and resin fuse to form a thin shell, under the action of heat from the pattern.

After a pre-set time, the pattern and flask are rolled over to discharge excess sand. The shell mould is cured at the next two stations by baking under electric heaters. At the ejection station, shown in Fig. 1, the hardened shell is automatically stripped from the pattern. Cores are then set, by

hand, in the drag half of the mould, and the cope and drag members are bonded together on a 4-station, automatic closing machine. An air-operated mechanism on this machine holds the two halves together, as seen in Fig. 2, while the adhesive sets.

Completed shell moulds are placed on a storage conveyor which has a capacity for 832 units. As required, moulds are inspected and transferred to trays suspended from an overhead trolley type pouring conveyor, shown in Fig. 3, the speed of which can be varied from 6 to 24 ft. per min. Backing sand is provided on the trays to support the moulds during pouring. The operator stands on a 24-in. wide moving platform while pouring the molten metal into the mould.

After the castings have cooled, the trays are automatically tripped to dump the crankshafts, mould remnants, and sand on to an oscillating conveyor (Fig. 4) for shaking out. The sand is collected and used again for backing-up purposes. Sprues and gates are removed from the cooled castings by means of a semi-automatic oxy-acetylene torch-cutting machine, and the crankshafts are shot-blasted.

The cleaned castings are placed in alloy-steel trays and heat-treated in an Ipsen controlled-



Fig. 3. SAE 4615 Steel is Poured into Shell Moulds Carried on a Conveyor, the Speed of which can be Varied from 6 to 24 ft. per min.

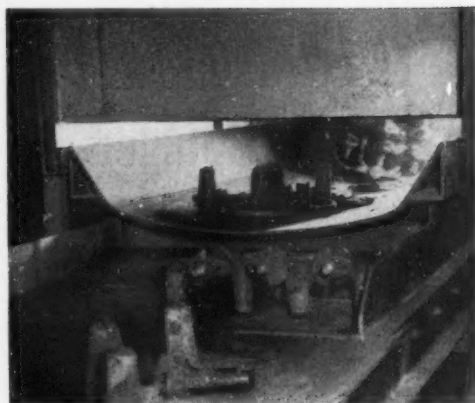


Fig. 4. Cooled Castings are Shaken Out of the Moulds on this Oscillating Conveyor. The Sand is Collected and Used Again for Backing-up

atmosphere, gas-fired furnace. For normalizing, the crankshafts are heated to 1,750 deg. F. and maintained at this temperature for one hour. An endothermic atmosphere of hydrogen and carbon-monoxide, prepared by passing a mixture of natural gas and air (in the ratio of 1 to 2½) through a heated retort containing a catalyst, is supplied to the normalizing furnace, which is of the radiant-tube, forced-convection type.

Cooling of the crankshafts is accelerated by means of two integral, water-jacketed cooling chambers on the furnace. The first chamber is equipped with a high-speed fan, and the cooling rate can be adjusted by varying the speed of the fan or the temperature of the water in the jackets. Crankshaft castings are cooled from 1,750 to 500 deg. F. in one hour. This normalizing treatment ensures a uniform hardness of 20 to 25 Rockwell C.; improves the machinability; and gives a grain structure most suitable for subsequent carburizing and hardening (after machining).

The comparatively rapid cooling to which the crankshafts are subjected introduces stresses which might cause distortion. For this reason, the castings are tempered in another Ipsen controlled-atmosphere furnace by heating to 1,150 deg. F. and holding them at this temperature for one hour. An exothermic atmosphere, obtained by burning a mixture of natural gas and air, and introducing the products of combustion into the furnace, is provided for this stress-relieving heat-treatment. The castings are rapidly cooled, in a



Fig. 5. A Semi-automatic, Abrasive Cutting-off Machine is Employed for Removing the Tie-bars that are Cast Between the Counterweight Checks of the Crankshafts

water-jacketed chamber, to about 150 deg. F. for handling purposes.

Tie-bars, approximately $\frac{3}{8}$ in. square, cast between the counterweight cheeks of the double-throw crankshafts, are removed on the Tabor semi-automatic, abrasive cutting-off machine shown in Fig. 5. Each shaft has two bars, and four cuts are necessary to remove them. The casting is placed on V-blocks and hydraulically clamped on the bearing surfaces. After two cuts have been taken, to remove one tie-bar, the work is indexed and advanced to position the second bar beneath the abrasive wheel.

A rubber-bonded, aluminium-oxide abrasive wheel, of 16 in. diameter by 0-100 in. wide, is used dry for this operation. The wheel is made up of a combination of 16, 20, 30, and 46 grain sizes.

The downward cutting stroke of the head is actuated by a hydraulic cylinder, and the upward stroke is regulated by a flow-controlled accumulator system. With this arrangement, the head is automatically returned to the top of its stroke on the release of the down-feed pressure, or in the event of failure of the hydraulic or electric power supplies.

Photo-electric cells are provided to control the point of feed engagement and to compensate for wheel wear. During the downward stroke of the

head, when the light beam from one cell is broken, the movement is automatically changed from rapid traverse to a pre-set feed rate for cutting-off. At the bottom of the stroke, the beam from the second cell is interrupted and the head is automatically retracted. The upper cell is connected by linkage to the wheel-head and the lower cell is moved by means of a cam arrangement so that compensation is made automatically for wheel wear.

Equipment for Testing Adhesion of Bearing Shell Linings

The equipment here illustrated, which was described in a recent issue of The Brush Group technical journal, is employed in the inspection department of Mirreles, Bickerton & Day, Ltd., to check the adhesion between a steel bearing shell and the white metal lining. This equipment incorporates a D.C. pot galvanometer; a lamp and scale; a Westinghouse rectifier; and suitable probe contacts. Current contacts pass a current of known amperage through the joint, and potential contacts detect the potential difference.

When the contacts are moved over the surface of the white metal by hand, any defect in the path of the current modifies the flow and consequently the potential difference at the probes. Such a defect is indicated by movement of the light spot.



Method of Testing Adhesion Between Steel Bearing Shells and White Metal Liners

Machining Bearing Housings on Monforts Chucking Automatics

Bristol Commercial Vehicles, Ltd., Bath Road, Brislington, Bristol, are manufacturers of complete passenger and heavy goods chassis for road vehicles, also of engines. For their gearboxes, bearing housings of various types are required, which must be finished to close tolerances, as regards size, surface finish, and concentricity of the exterior and bore of the body. These components are machined from malleable iron castings, in batches, and the production operations formerly consisted of roughing and semi-finishing the external surfaces and faces on a turret lathe; roughing and semi-finishing the internal surfaces, also on a turret lathe; finishing the external surfaces on a cylindrical grinder, and finishing the internal surfaces on a fine-boring machine. Substantial savings in production time have now been effected by the use of two Monforts KA. 200/150 single-spindle, chucking automatics, for which the selling agents in this country are Sidney G. Jones, Ltd., 8 Balham Hill, London, S.W.12. Moreover, grinding and fine-boring have been eliminated.

The two Monforts machines are shown in the Bristol works in Fig. 1, and before considering the operations on the bearing housings, it may be of interest to discuss, briefly, the design of these machines. Of generous proportions, the work-

spindle is supported in a pair of preloaded ball bearings at the front end, the bearings being positioned as close as possible behind the integrally-forged flange. There is a third ball bearing in a central position, and a fourth at the rear end. The main cutting loads are taken by the front and centre bearings, and the rear bearing supports the chucking cylinder and the clutch mechanism. Two multi-plate clutches are mounted between the centre and rear bearings, and are employed to engage either the upper or lower speed range. The clutches are actuated by a common striking mechanism, which is hydraulically operated. Within each range, the speeds can be varied steplessly by means of a P.I.V. gearbox, also hydraulically-operated, to which drive is transmitted from an 8½-h.p. motor at the rear of the machine, through multiple V-belts. This arrangement provides a standard overall range of spindle speeds from 65 to 1,350 r.p.m., but machines can be supplied with other speed ranges, if required. The driving motor is of the sliding-rotor type, with an automatic brake, and the spindle speed can be changed at any stage in the cutting cycle, independently of the cutting operation that is being performed, the actual speed being indicated on a large tachometer on the front of the headstock.

A 10-in. Forkardt 3-jaw hydraulic chuck is

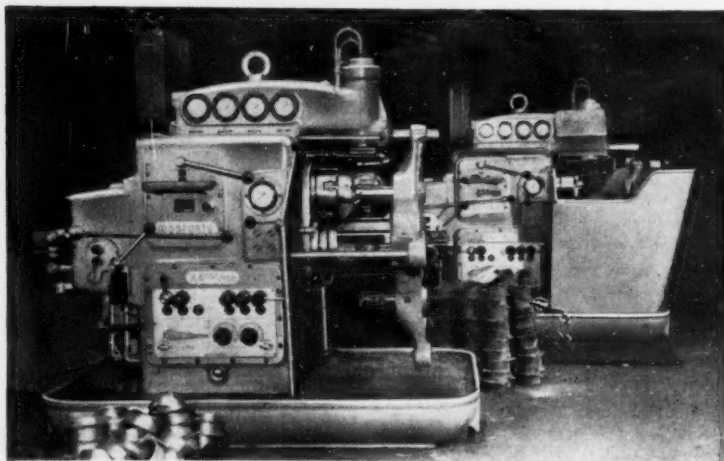


Fig. 1. The Two Monforts Single-spindle Chucking Automatics Installed at the Works of Bristol Commercial Vehicles, Ltd., for Roughing and Finishing Operations on Bearing Housings for Gearboxes

mounted on the flanged nose of the spindle, and is connected by a draw-bar to the double-acting operating cylinder at the rear, which is of the rotating type. Other types of chucks, and special internal or external work-clamping units, can be fitted, and workpieces of 8 in. maximum diameter can be accommodated.

Below the work-spindle, and accurately aligned with it, is the turret shaft, which carries the 4-station turret and tool-holder slide at the right-hand end, and the main control drum at the left. The turret shaft is of large cross-section, and forms the piston rod of the turret-feed cylinder. This cylinder is housed within the headstock and it is secured by an integral flange and multiple bolts to a facing on the right-hand end-wall. The turret shaft slides in a long, lined bearing in an outwardly-projecting extension of the feed cylinder, and in a second lined bearing in the left-hand end-wall of the headstock. A taper is machined on the extreme right-hand end of the turret shaft, whereon the cruciform turret is mounted and keyed, and it is secured in position by a large nut. The tool-holder slide is bolted to the inner face of the turret, and moves on the outside of the feed-cylinder extension.

The cruciform turret is of massive proportions, and each arm has an accurately-bored hole in line with the work-spindle, as may be seen in the close-up view, Fig. 2. On the inside of the turret, surrounding this hole, there is a rectangular boss, with four tapped holes, and the face of this boss is machined accurately at 90 deg. to the spindle axis. The bored hole and boss provide for mounting tool-holders and bars, as indicated at A, of which there is a large standard range, embracing copy-turning and swing-turning tool-holders, as well as conventional boring bars. At the outer end of the arm there is a second hole, with a lapped, hardened bush which engages a lapped, hardened pilot bar that extends from an overarm mounted on top of the headstock. Since the distance from the axis of the turret shaft to the centre of the pilot bore is more than twice that from the turret shaft to the tool bore, it will be appreciated that the alignment between the tool holder and the spindle can be maintained within very close limits of accuracy. The turret tools are indexed in the upward direction, as viewed from the front of the machine, and a cylindrical brush is mounted on a bar that extends from the headstock. During each cutting cycle, the pilot bore that is to be used for location at the next cycle passes over this brush, so that any swarf or other foreign matter that might have lodged in it is removed. The hub of the turret carries four stop screws, as indicated at B, which have hexagon sockets at their outer ends, and the

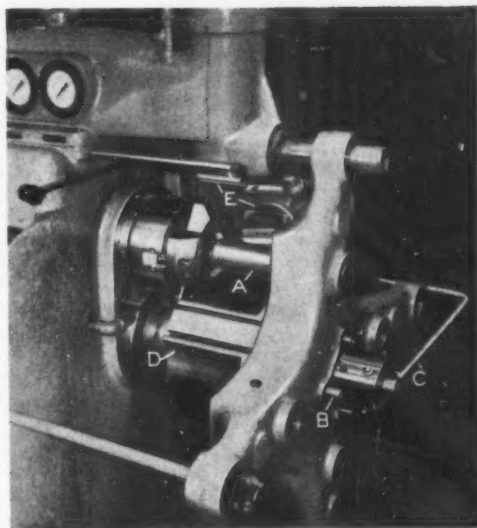


Fig. 2. Close-up View of the Turret of One of the Monforts Chucking Automatics Set up for Operations on Gearbox Bearing Housings

inner ends of these screws engage hardened pads in the feed-cylinder extension, to control the position of the turret at the end of its cutting movement. Between each stop pad there is a hole to receive the screws, when the arms of the turret are in the "45 deg." positions. The nut that secures the turret unit to its shaft forms one member of a distributor, whereby cutting fluid is directed from the pipe C to the four tool stations. Individual cocks are provided to control the coolant supply to each position.

Indicated at D, the tool-holder slide has four faces, which are positioned between the arms of the turret to provide maximum clearance for the cutting tools. Each face of the slide has two T-slots to receive the securing bolts for tool-holders, which include normal turning and swing-turning types, also for the template carriers for the latter units, and for the turret tools. Normally, the maximum length that can be turned is 6 in., but under certain conditions, this length can be increased to 7½ in. The feed rate of the turret assembly can be varied steplessly from ¼ to 11½ in. per min.

In addition to the tool-mounting arrangements mentioned, there are two independent radial slides, one vertical and the other horizontal, and these slides are indicated at E in Fig. 2. Each slide is

hydraulically operated, and has a tool-carrying member which moves in an outer housing fixed to the headstock of the machine. The tool slide is bored, hardened and lapped, so that it serves as the cylinder for a hydraulic ram, and the piston of the ram is attached to the outer end of the slide housing. A hardened and lapped bush is fitted to the outer end of the slide, and engages the large-diameter piston rod. The slide is well supported, and facing, grooving and relieving operations can be performed without the risk of chatter. The feed rate is adjustable steplessly from $\frac{1}{4}$ to 5 in. per min., and the maximum travel of the vertical slide is $3\frac{1}{2}$ in., and of the horizontal slide, 3 in., the inner and outer positions of the slides being controlled by stop screws. At the end of each slide, there is a dovetail seating for the tool-holders, which, again, may include copying units.

HYDRAULIC CONTROL SYSTEM

The lower part of the headstock serves as an oil reservoir for the hydraulic system. Pressure oil is supplied by a pump unit housed in the headstock, and the pump is driven by a flange-mounted $5\frac{1}{2}$ -h.p. motor at the rear. This motor is controlled by two push-buttons at the front of the

headstock, immediately below the tachometer, and a second pair of push-buttons in the same position provide for the control of the spindle-driving motor. An oil cooler is provided at the rear of the machine, and can be brought into operation when required. On the front of the headstock, at the top, there are four gauges, which indicate the pressure of the oil that is being supplied to the cylinders for operating the turret, the two radial slides and the chuck.

Levers and knobs at the front of the headstock provide for the manual control of the various units. The lever below the pressure gauges actuates the clutch, whereby the high and low speed ranges are selected. Within each range, the speeds can be steplessly varied by moving the long lever, which is pivoted at the left-hand end of the headstock (as viewed in Fig. 1). Also at the left of the headstock are the cycle start lever, and two knobs which serve as an additional means of speed range selection. To the left of the tachometer, below the speed-range selection lever, there is a knob for engaging the rapid traverse of the turret during setting-up operations.

The main hydraulic control panel is mounted on the lower part of the headstock. A lever at the upper left-hand corner of the panel controls the turret indexing motion, and can be moved to two positions, one of which provides for manual operation, and the other for automatic indexing. To the right of this lever there is a knob, which can be turned through 90 deg., for the selection of automatic or manual operation of the turret unit. Three similar knobs, further to the right, provide for manual or automatic operation of the two cross-slides and the chuck. The chuck knob, it may be noted, is mechanically coupled to the lever immediately below the tachometer, so that the chuck may be manually operated from either position.

Below the row of knobs, there is a series of control-screws for the relief valves in the circuits for the turret, cross-slides, indexing cylinder and chuck. At the bottom of the panel, to the right, there are two manual controls for altering the feed rates of the cross-slides, the rates of these units being indicated by pointers with reference to calibrations. The turret feed rates can only be modified by the automatic control mechanism, as will be explained later, but the rate of feed is indicated by a large pointer at the left, towards the bottom of the panel. In the lower left- and right-hand corners of the panel there are operating handles for the wiper blades which clean the oil filters in the hydraulic circuits.

A close-up view of the main control drum at the left-hand end of the headstock is given in

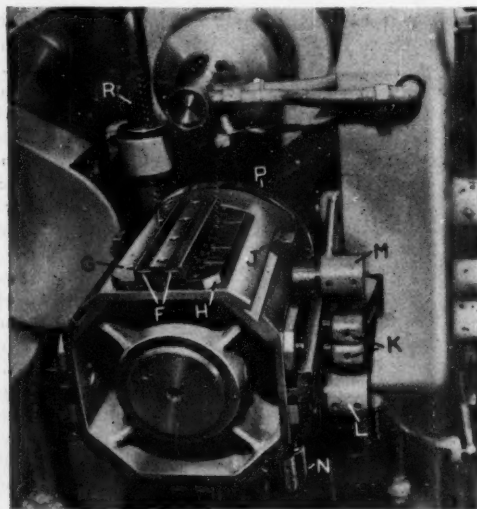


Fig. 3. The Control Drum which is Mounted on the End of the Turret Shaft of a Monforts Machine. All Turret and Cross-slide Motions, also Speed and Feed Changes, are Controlled by Dogs and Cams on this Drum

Fig. 3. The drum is mounted on the end of the turret shaft, and, in consequence, is moved longitudinally, and indexed, with the cruciform turret. It has four broad faces and on each face is secured a carrier, of T-section, in which there are two dovetail grooves *F* to receive trip dogs. At one side of the carrier can be fitted a plate *G*, and the fixing screws pass through slots in this plate so that it can be set at any angle, within a certain range. On the opposite side of the carrier to this plate can be mounted a series of cam plates, as may be seen at *H*. Between the flat faces on the drum there are dovetail slots in which can be fitted trip dogs, as indicated at *J*.

The various cam plates and trips that have been described are operative when the flat face with which they are associated is in the "3 o'clock" position, as viewed in Fig. 3. Then, as the turret is advanced, the dogs in the slots *F* trip one or other of the levers *K* to engage the high or low speed range. As the turret movement continues, its rate of advance is controlled by movement of the lever *L* by the cam plates *H*, and the speed of the work-spindle is increased or decreased as a result of the displacement of the lever *M* by the cam plate *G*. Rapid traverse of the turret is controlled by the dog *J*, which trips the lever *N*, the setting of this dog governing the position in the turret movement at which the rapid motion is disengaged.

When the inward traverse of the turret has been completed and the dead stops are engaged, pressure builds up in the circuit. Then, a valve is actuated and the turret unit is returned automatically at the rapid traverse rate, and, in consequence, the control drum is moved towards the headstock of the machine. Towards the end of this movement, when the turret has moved clear of the overhead steady arm, the annular cam plates *P* depress the main indexing control valve, the spool of which projects from the headstock. At the same time, a gear on the turret shaft, adjacent to the inner end of the control drum, is engaged with the vertical rack *R*. The rack-teeth are cut on the piston rod of a hydraulic cylinder, and when the indexing valve is fully depressed, oil is directed to the upper end of the cylinder, so that the rack is moved downwards, and the control drum, turret shaft and turret are rotated. A stop collar on the rack limits the movement, with the result that the turret shaft assembly is turned through 90 deg., and, at the end of this motion, the rapid advance of the turret is engaged, to start the next stage of the cutting cycle.

At the inner end of the control drum there are four pairs of tapped holes, which are displaced 45 deg. relative to the flat faces. These holes

provide for mounting either one or two cam blocks. As the control drum is rotated, between successive turret cutting traverses, these blocks depress the spools of either of two valves, mounted below the drum, and thus engage the infeed motions of the radial slides. The annular cam plates *P* are reversible, it may be noted, and in one side of each there is a cut-out, of flattened V-form. If one of the cam plates is positioned on the drum so that the cut-out is towards the headstock, the follower on the end of the main indexing control valve spool enters the cut-out during one of the indexing movements. The control valve then can move away from its depressed setting, and the indexing movement is stopped with the arms of the turret at 45 deg. to the horizontal and vertical positions. It is usually arranged for the turret to stop in this position at the end of the cutting cycle, in order to provide the maximum clearance for unloading and loading.

The base of the machine serves as a reservoir for coolant, which is delivered by a motor-driven pump to an adjustable nozzle, above the spindle, or to the turret-mounted tools, as already explained. Large splash guards surround the cutting area, but the guards have been removed from the machine in the foreground in Fig. 1, so that the turret and tool-holder slide can be seen.

OPERATIONS ON BEARING HOUSINGS

Typical bearing housings machined on the Monforts single-spindle chucking automatics are seen in Fig. 4. The machines shown in Fig. 1 and 2 are set-up for operations on the housing seen at the upper left in Fig. 4, and an un-machined malleable iron casting for this component is seen in the centre of the bottom row. Originally, the operation stages for this workpiece were as follows:—(1) turn the external surface of the body, from both sides of the flange, and turn the end face, on a turret lathe, in a floor-to-floor time of 6 min.; (2) machine the main bore, finish-machine the flange face, and finish the smaller bore in the end, on a turret lathe, in a floor-to-floor time of 5½ min.; (3) grind the external surface of the body to 5.0625/5.0635 in. diameter, also both flange faces, in a floor-to-floor time of 5 min.; (4) finish the internal surfaces to 4.7242/4.7249 in. diameter and to a depth of 1.3115/1.3135 from the front flange face on a fine-boring machine, in a floor-to-floor time of 2½ min. The total floor-to-floor time required for this series of operations was 19 min.

The bearing housings are now machined in four stages on the Monforts machines, the machine in the background in Fig. 1 being employed for

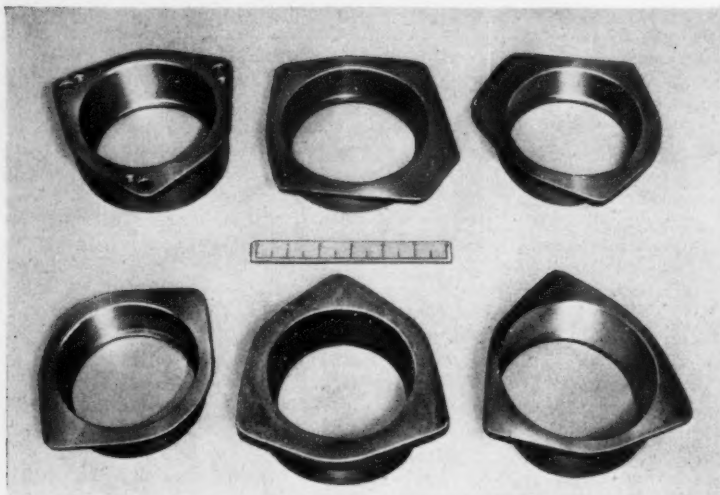


Fig. 4. Typical Gear-box Bearing Housings which are Machined on the Monforts Chucking Automatics at the Works of Bristol Commercial Vehicles. A Malleable Iron Casting, before Machining, is seen in the Centre of the Bottom Row

roughing, and the other machine for finishing. A drawing of the component and diagrammatic layouts for the various stages in the machining sequence are shown in Fig. 5. For the first roughing stage, the workpiece is gripped in special soft jaws, and is located endwise by engaging the flange face with pegs in the jaws. A combination boring bar mounted in the turret is advanced at a feed rate of $1\frac{1}{2}$ in. per min., and carries two tools which machine the main bore and the bore in the internal flange at the small end. Simultaneously, a tool A in a holder on the vertical slide faces the flange, at a feed rate of 1 in. per min. For these operations, the spindle is run at 120 r.p.m., and the floor-to-floor time is $1\frac{1}{2}$ min.

For the second roughing stage, the workpiece is gripped in the bore by special soft jaws, and is located endwise by the machined flange face. The same feeds and speeds are used as for the preceding stage. A single-point tool mounted in a holder on the turret is employed to machine the external surface of the body of the housing, leaving material for subsequent finishing operations, and two tools in a double holder B, on the vertical slide, are applied to machine the flange, also the face at the small end. The floor-to-floor time for this stage is $1\frac{1}{2}$ min.

For the first finishing stage, the workpiece is again gripped in the bore, and is located endwise by the external flange. With the work-spindle running at 160 r.p.m., a tool C, mounted in a bar in the first turret position, is applied to machine the external surface of the body to 5.103 in. diameter, at a feed rate of 2 in. per min. At the

same time, two tools in the double holder D, on the vertical slide, are advanced at a feed rate of $1\frac{1}{2}$ in. per min. to machine the flange, and the face at the small end of the part, leaving about 0.010 in. of metal for removal during the next operation.

The surfaces mentioned are machined again by tools in the second turret position, and in the horizontal slide. A tool E turns the external surface of the body to 5.071 in. diameter, and a tool F forms a radius on the end, both tools being advanced at a feed rate of $1\frac{1}{2}$ in. per min. Simultaneously, two tools in the holder G, on the horizontal slide, machine the flange and end face to finished size, at a feed rate of 1 in. per min. For these operations, the work-spindle is run at 160 r.p.m.

For the last operation in the first finish machining stage, the spindle speed is increased to 260 r.p.m. A tool on the main slide, at the third turret position, machines the external surface of the body of the workpiece to finished size, at a feed rate of 1 in. per min. The floor-to-floor time for the complete cycle of operations comprising the first finishing stage is $3\frac{1}{2}$ min.

The workpiece is gripped on the body, in special soft jaws, for the second finishing stage, and is located endwise by the machined flange face. With the work-spindle running at 160 r.p.m., two tools in a double boring bar H, at the first turret position, are advanced at a rate of 2 in. per min. to machine the main bore and the hole in the flange at the small end. Approximately 0.010 in. of metal (a side) is left in the smaller bore, and 0.020 in. of metal (a side) in the larger bore. During the

boring traverse, a tool *I* in a holder on the vertical slide is advanced, at a feed rate of 1½ in. per min., to face the flange, again leaving 0.010 in. of metal for subsequent finishing.

Finish-facing of the flange is carried out by a tool on the horizontal slide, while a second boring stage is being performed by tools in the second turret position. The facing tool *K* is mounted in a holder which is provided with fine adjustment, and is advanced at a feed rate of 1 in. per min. A double holder *L* carries the boring tools, one of which finishes the hole in the flange at the small end, while the other machines the larger bore, leaving 0.005 in. of metal (a side) for subsequent fine boring. The boring tools are advanced at a feed rate of 1 in. per min.

Next, a tool at the third turret position forms a chamfer in the open end of the bore. The feed rate for this operation is 2 in. per min., and, for all the machining so far, the work-spindle is run at 160 r.p.m. For the final fine-boring stage, the spindle speed is increased to 300 r.p.m., and a tool in a holder *M*, at the fourth turret position, is advanced at a rate of 2 in. per min. This holder is provided with fine adjustment. The floor-to-floor time for the second finishing stage is 3½ min., and the total floor-to-floor time for the complete series of four machining stages is 9½ min.

A generally similar series of machining operations is employed for the bearing housing seen at the lower left in Fig. 4. In this instance, the main bore is machined to 3.9369/3.9374 in. diameter, the body diameter is held to 4.313 in. ± 0.0005 in., and the overall length is 1.437 in. The floor-to-floor times for the various stages with the original method were as follows: rough and semi-finish on a turret lathe, 5.0 min.; rough and semi-finish on a turret lathe, 4.5 min.; grind, 4.5 min.; fine bore, 2.8 min.; and turn a circlip groove, 1.5 min. (total 18.3 min.). Using the Monforts machines, the various stages, corresponding to those described above, are completed in floor-to-floor times of 1.92, 2.24, 2.52 and 2.92 min. (including machining the circlip groove), and the total floor-to-floor time is 9.6 min. The total setting time for the Monforts machines (four stages) is 240 min., and for the five machines required for the original method it was 150 min. Taking setting-up into consideration,

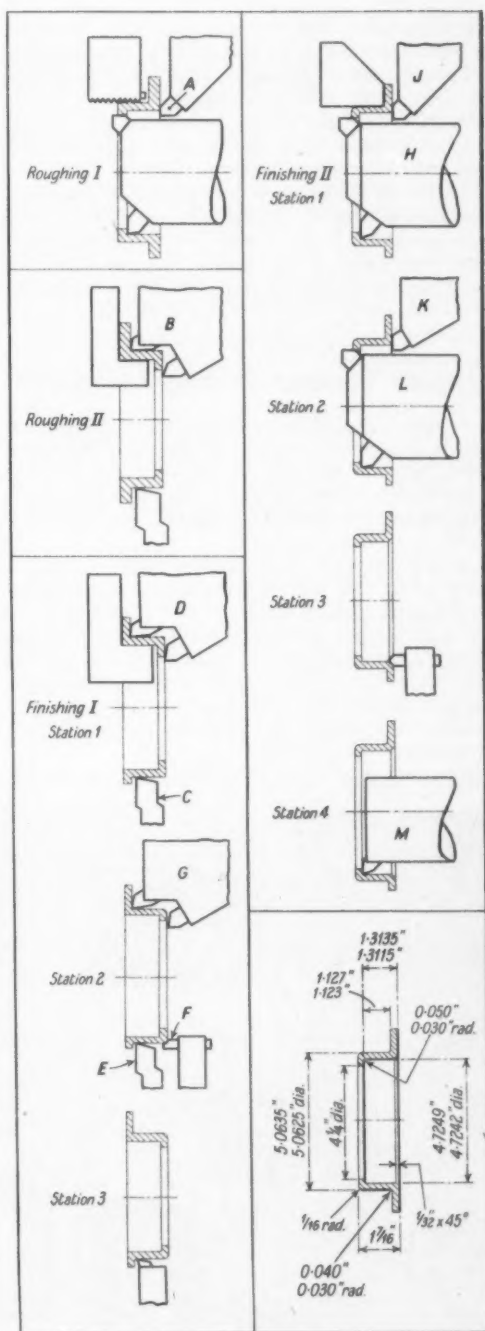


Fig. 5. Cross-sectional View of the Bearing Housing seen at the Left in the Upper Row, Fig. 4, with Diagrammatic Layouts of the Operations whereby it is Machined, in Four Stages, on Two Monforts Chucking Automatics

the time saved when the new method is employed to machine a batch of 200 parts is approximately 27 hours, and when a batch of only 50 parts is machined the saving is approximately 2 hours. Moreover, it is stated that, when the old method was used, about 15 to 20 per cent of a batch was rejected, for various reasons, by the inspection department, whereas of one particular batch of housings produced by the new procedure none was rejected. It was found that the external surface was round within 0.0005 in., the bore was round within 0.0003 in., and the bore and exterior were concentric within 0.0002/0.0004 in.

Jaguar Gearbox Testing Equipment

Gearbox testing equipment which simulates, as nearly as possible, actual road test conditions, has been installed recently by Jaguar Cars, Ltd., in co-operation with Heenan & Froude, Ltd., Worcester, who designed and built the test equipment.

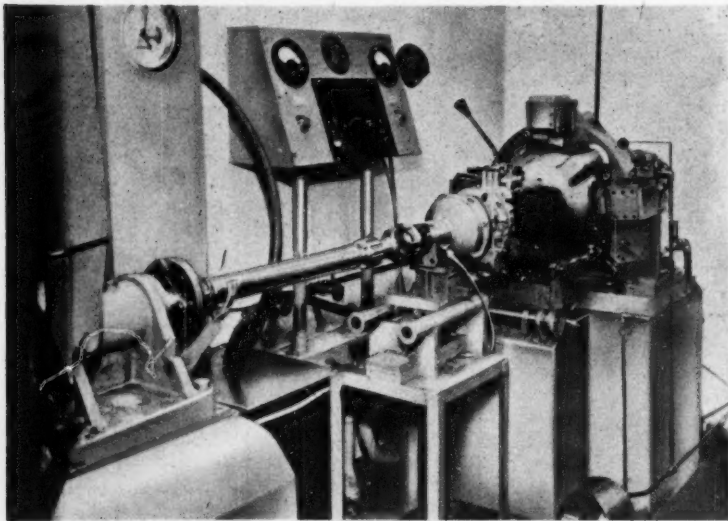
A constant-speed A.C. electric motor is used in place of the car engine, and this motor is coupled to the input shaft of a "slave" clutch by a Heenan-Dynumatic eddy-current coupling. This coupling serves a dual purpose, in that, when the gearbox is being tested in the normal manner, it provides a variable-speed drive, whereas for "over-run" test conditions it is used to absorb the power which is transmitted by the gearbox. For "over-run" conditions, which are equivalent to the gearbox

being driven by the road wheels of the car, a smaller electric motor is used, connected to the output shaft of the gearbox by a similar eddy-current coupling. The gearbox and testing controls are contained within a sound-proof room, and the input and output shafts of the gearbox extend through the walls of this cubicle to their respective driving motors and couplings, which are mounted on concrete plinths.

A view of the inside of the sound-proof room is given in the accompanying illustration, and the controls for the eddy-current couplings, also the torque-tube and universal couplings attached to the output shaft of the gearbox, can be seen. The gearbox is secured by quick-operating clamps, and an air-operated hoist is provided for removing the tested unit, and placing a fresh gearbox in position. The "slave" clutch assembly is permanently mounted on the concrete block at the right of the figure, and when this clutch is operated by the pedal seen at floor-level, gear-changing can be carried out in the conventional manner.

In operation, each gear ratio is tested, firstly, at various speeds and loads while it is being powered by the main drive motor. For this test, the variable-speed section of the clutch on the main motor is energized, and a varying load is applied by the brake section of the clutch for the smaller motor. When "over-run" conditions are required, the functions of the two clutches are reversed, and this change is made by a simple two-position switch on the control board. Driving speeds can be varied steplessly throughout the entire range, as can the load which is being applied.

It is stated that the sound-proof cubicle enables a fairly small degree of gear-meshing noise to be detected.



The New Gearbox-testing Equipment Recently Installed by Jaguar Cars, Ltd., in consultation with Heenan & Froude, Ltd., Worcester, who Designed and Built the Equipment. The Equipment is Housed in a Sound-proof Cubicle

The Sixth Mechanical Handling Exhibition—3

The British Thomson-Houston Co., Ltd., Rugby. Stand No. 317, First Floor.

The exhibits on this stand are representative of the wide variety of electrical equipment made by the company for mechanical handling applications. B.T.H. electro-hydraulic Thrustors, which are being shown, are designed to exert smooth, straight-line, constant-pressure thrust, and can be used to actuate lever mechanisms, and to operate clutches and brakes, for example. These units are available in sizes ranging from 40 lb. thrust and 2-in. stroke, to 800 lb. thrust and 12-in. stroke.

Comprising two components, a motor and its associated starting unit, the B.T.H. Stayrite single-phase power drive may be either hand or push-button operated. The design of the foot-mounted motor complies, where applicable, with British Standard 2613/1957, and it may be of the protected or totally-enclosed, fan-cooled type, an example of the latter being seen in Fig. 1. Both types of starters, which incorporate capacitors, undervoltage and overcurrent trips, and integral start and stop buttons, are enclosed in sheet metal housings, arranged for wall mounting.

Demonstrations are being given of the B.T.H. capacitor/D.C. system for squirrel-cage motors, whereby the rotating masses are brought to rest

by a combination of capacitor and of direct current injection braking. It is claimed that this system provides for very rapid stopping with low power consumption, and requires no extra space or machine maintenance.

The type TRP 2 infra-red radiation pyrometer, which is on view, is capable of determining the temperature of a surface as small as 0.40 in. diameter. In order to reduce the weight of this instrument, transistor circuits have been used.

Other items include the B.T.H. Portavox mine telephone, which has been specially developed for the purpose of speech reinforcement in very noisy locations, and a working model of the 110-Ruston-Bucyrus excavator, which incorporates B.T.H. electric motors, Ward-Leonard motor-generator set, and associated equipment.

It may also be noted that Varislip equipment, which was developed and jointly patented by B.T.H. and the Vaughan Crane Co., Ltd., is on view on the stand of the latter company. This unit comprises an A.C. motor and an eddy-current coupling enclosed in a single casting.

H.M.C. Wheels, Ltd., High Street, Hornsey, London, N.B. Stand No. 206, First Floor

The range of cast iron single-flanged wheels made by this company has been extended, and a new range of double-flanged wheels has been introduced. Examples of wheels and castors for general industrial use are on show, including cast iron and rubber-tyred wheels from 2 to 16 in. diameter, and a selection of castors, from 2 to 12 in. diameter, with various types of fittings.

J. Collis & Sons, Ltd., Regent Square, Gray's Inn Road, London, W.C.1. Stand No. 27, Ground Floor

The BP 1-ton pallet-type truck seen in Fig. 2, which is being shown for the first time, incorporates a multi-stage hydraulic unit for raising and lowering the carrying forks. This unit is operated by means of the spring-balanced haulage handle, which has a low fulcrum point to permit increased leverage. Four fork lengths ranging from 32 to 48 in., and four widths, from 18 to 30 in., are available, and rollers are fitted to the outer extremity of each fork, to assist entry into, and withdrawal from, the pallet.

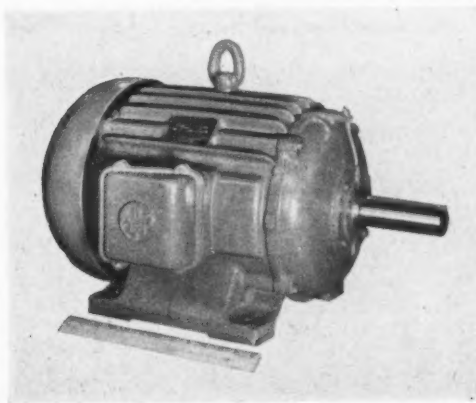


Fig. 1. Type KNS-B, Totally-enclosed, Fan-cooled Motor from the B.T.H. Stayrite Range



Fig. 2. Collis BP 1-ton Pallet-type Truck

The hydraulic movements are controlled by a foot-operated valve, and the extent of the vertical travel of the forks, up to a maximum distance of 8½ in. from ground level, can be predetermined. The speed of lowering is positively controlled, and can be pre-set to suit the type of load being carried.

A selection of all-hydraulic and assisted-leverage trucks, with carrying capacities up to a maximum of 7½ tons, is on view, also electro-hydraulic and manual-hydraulic stacker trucks from 2¼ cwt. to 5 tons rating, with either rigid-hinged or telescopic heads.

This company can supply a wide variety of conveyors of the gravity- and powered-roller types, and examples of these are on show. The MotaVeyor belt-conveyor is available in either sectional or unit forms, and the latter version comprises an assembly of portable units which are connected by Inter-couplers, power being provided by one or more driving cabinets. For supporting the units, a range of fixed or adjustable stands is available, and these stands also enable the floor-to-belt height to be varied between 10 and 50 in.

The sectional form of the MotaVeyor is primarily intended for installations where further extensions, and movement of the conveyor from site to site, are not required.

LoadaVeyor belt conveyors, which are also being exhibited, are available in mobile, fixed, and boom unit types, and other equipment on view includes the SlatVeyor slat/chain type conveyor; the VertiVeyor, which is a continuous, vertical, carrier-chain type unit; and the TransVeyor table. The

latter is an omni-directional transfer table on which the load is supported on a number of ball units, and can be moved horizontally in any direction with the minimum of effort.

Super Oil Seals & Gaskets, Ltd., Birmingham Factory Centre, Kings Norton, Birmingham. Stand No. 304, First Floor.

The Aeroquip range of high-pressure flexible hose assemblies, with detachable and re-usable fittings, is displayed, together with SuPerfect oil seals, hydraulic packings and O-rings, and selections of Fidrac synthetic-rubber precision mouldings.

Also on show is the company's range of Redcap polythene threaded caps and plugs, for protecting the threads on tubes, hose fittings, and similar parts.

Fisher & Ludlow, Ltd., Material Handling Division, Bordesley Works, Birmingham, 12. Stand No. 72, Ground Floor

A working exhibit on this stand is a Flowlink overhead chain conveyor which is connected by means of ball pendant chains to a number of Towline trucks.

The Flowline roller top conveyor on view incorporates contra-rotating rollers which enable workpieces to be indexed. This conveyor permits parts to be brought to various positions adjacent to machines, for example, and buffer stocks of components can be built up if required.

Examples of the company's Flowpack collapsible box pallets, of pressed steel construction, are on view. One of these pallets, known as the type L, is shown in Fig. 3 in the folded condition. To fold the pallet, the side pieces are removed, and placed on the base, and the end members, which

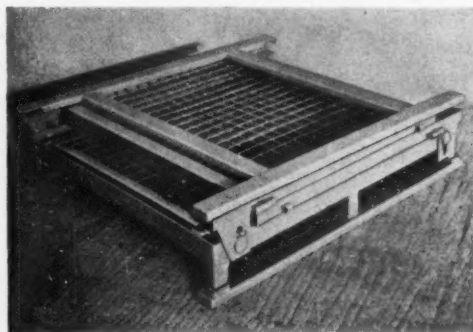


Fig. 3. Flowpack Type L Collapsible Box Pallet Shown in the Folded Condition. The End-members Incorporate Patent Self-locking Hinges

incorporate patent self-locking hinges, are swung downwards. The type H collapsible box pallets have corrugated metal bases and sides and no loose parts are incorporated.

Attention may also be drawn to the Flowfeed work delivery equipment which was described in MACHINERY 90/1273—7/6/57. Intended for mounting on the shop floor at the side of a machine, this equipment incorporates a hopper tray into which components to be machined are fed by gravity from an inclined box pallet with a sliding door at one end. A second box pallet is provided for the reception of workpieces after they have been machined.

Angel Truck Co., Ltd., Meteor Works, 215-219 Albion Road, Stoke Newington, London, N.16. Stand No. 35, Ground Floor

The display on this stand includes a selection from the wide range of hand- and power-operated handling and transporting equipment made by the company, also examples of stillages and pallets, of various types, for use in conjunction with pallet transporters and lifting trucks. Attention may be drawn to the Delta series of stillage lifting trucks, which have recently been the subject of design improvements.

Among the conveying equipment exhibited, there is an entirely new version of the Slide-bench conveyor, which has a framework constructed from square-section steel tubing.

A battery-electric, works, platform truck, with the latest Tractamatic drive unit and an Excelsire chassis, is being demonstrated, and several of the hand trucks on view are arranged for sub-ground level automatic Towveyor operation. Standard trolleys, ladders, wheels, and castors are also being shown.

Ransomes, Sims & Jefferies, Ltd., Orwell Works, Ipswich. Stand No. 74, Ground Floor

In Fig. 4 is shown the NR 30 fork-lift truck, with a capacity of 3,000 lb. at 24-in. load centres. This truck is one of a recently-introduced range which also includes the NR 15 and 20 types, and has now been extended by the addition of the NR 40 truck, of 4,500 lb. capacity at 24-in. load centres.

A variety of other industrial trucks is on view, and among them may be noted the T4 electric tractor, which will haul a load of 10 tons at approximately 3½ m.p.h.; the NU crane truck, with a lifting capacity of ½ ton and a carrying capacity of 1½ tons; the ENU elevating platform truck, with a lift height of 4½ in., a 5-ft. by 2-ft. 2-in. platform, and a capacity of 2 tons; and the TE1.H fixed-platform truck, of 1 ton capacity.

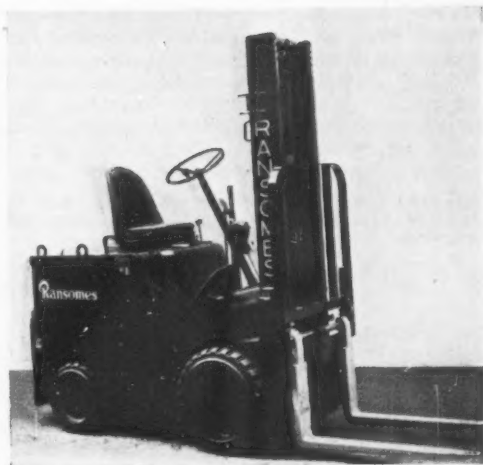


Fig. 4. Ransomes, Sims & Jefferies NR 30 Fork-lift Truck

Another exhibit is the ITW industrial tractor, for which a choice of petrol, diesel, or V.O. engines is available. This tractor is shown fitted with a truck shunting attachment and a Boughton heavy-duty winch.

Westinghouse Brake & Signal Co., Ltd., 82 York Way, King's Cross, London, N.1. Stand No. 305, First Floor

Prominence is being given on this stand to the company's wide range of pneumatic control equipment for excavators and hoppers, for example. A new coupling for compressed air lines, known as the Simplifix, is also on view.

Of particular interest to colliery engineers is a desk for pneumatically controlling and decking mine cars. The products of the Rectifier Division are represented by a selection of battery chargers and transformer-rectifier sets.

BTR Industries, Ltd., Herga House, Vincent Square, London, S.W.1. Stand No. 222, First Floor.

Shown at the Mechanical Handling Exhibition for the first time is a selection from the company's range of High Test V-belts of grommet construction, also examples of High Cap V-belts.

Gripface conveyor belting, which is being displayed, incorporates numerous rubber teeth to enable loads to be carried on steep inclines without slip. An example of this belting is being demonstrated on an inclined conveyor which is adjustable for angle. A new fire-resistant conveyor belting

on view has recently been added to the company's Pluvicor range and is intended for carrying coal in either direction on gradients exceeding 1 in 3.

Among other exhibits may be mentioned rubber and canvas conveyor belting, impact idlers, and anti-vibration mountings, also a selection from the firm's range of industrial hoses.

Allspeeds, Ltd., Oakenshaw Works, P.O. Box 45, Clayton-le-Moors, Accrington, Lancs. Stand No. 358, First Floor

The display of Kopp steplessly-variable speed gears covers the complete range of sizes, from 1/33 to 15 h.p., each of which has a speed variation of 9:1, and provides for output speeds from one third to three times the input speed. Variators are displayed separately, also with various combinations and makes of electric motors and reduction gears, with electrical and mechanical remote control, and remote speed indicating arrangements.

Photographs and particulars are provided of the new Allspeeds demonstration vans, which contain working models from the range, and are available for visits to customers' factories.

Ransomes & Rapier, Ltd., P.O. Box No. 1, Waterside Works, Ipswich. Stand No. 56, Ground Floor

The Rapier 4 fast standard mobile crane, seen in Fig. 5, has been designed to meet the needs of inter-depot service on railways, road haulage systems, and similar undertakings, and can work in congested areas which would be inaccessible to a lorry-mounted crane. It has good manoeuvrability, and is essentially a crane with a normal road-travelling performance.

At an out-reach of 4 ft., this crane has a lifting height of 14 ft. and a load capacity of 8,000 lb., and at an out-reach of 10 ft. 4 in. the corresponding lift and load figures are 6 ft. and 3,600 lb. Higher lifts, and greater out-reaches, are obtainable, by the use of various jib extensions.

The Rapier 12/24 Super fork truck is intended for use with long loads, such as timber, steel sections, and pipes, which are required to be moved along restricted width gangways and passed through narrow doors. The design is similar to that of a conventional fork truck, but the mast is arranged to swivel to one side, so that the longitudinal axis of the load is in line with the direction of travel. In operation, the truck approaches the load with the forks leading, in the normal manner, and when the load has been lifted, a combined steering and slewing movement is employed to bring the axis of the truck parallel with that of the load.

Amplly powered for hill climbing, this truck has a maximum road speed of 20 m.p.h., and



Fig. 5. Rapier 4 Fast Standard Road-travelling Crane

incorporates a patented self-steering mechanism which is claimed to reduce driver fatigue, particularly when manoeuvring at low speed. The carrying capacity of this machine is 12,000 lb. at a distance of 24 in. from the face of the forks.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. Stand No. 240, First Floor

Included among this company's exhibits are a 2-motor hoist control system for cranes, and Perigrip electro-mechanical brakes of the 4-, 6- and 10-in. sizes. Of compact design, the brakes are suitable for use on cranes, hoists, rolling mill auxiliaries and machine tools, and provide for close control of "inching" movements. The shoes are brought into contact with the brake drum by a powerful compression spring, and are released by a magnet when the current is switched on. In consequence, the brake is automatically brought into operation in the event of failure of the power supply. If required, the brake can be arranged for hydraulic operation.

Various types of electric motors, also control equipment, which includes push-buttons, selector switches, and indicator lamps, are being shown, as

representative of the range made by the company. Attention may also be drawn to the Magistor photo-transistor relay (**MACHINERY**, 90/1219—31/5/57), which finds applications for counting, level control, warning devices, height gauges, door control, inspection, edge position control, sequence checking, and sorting.

Dunlop Rubber Co., Ltd., 19 New Bond Street, London, W.1. Stand No. 202, First Floor

Among the products of the Belting Division of the company which are being displayed on this stand may be noted the recently-introduced Starwear conveyor belting, which is of cotton and synthetic fibre construction, and is available with an anti-static, fire resistant covering of rubber or P.V.C. Other new items on view include Starhete heat-resisting conveyor belting, for handling materials with temperatures up to 300 deg. F., and Stargrip belting which has a special face tread for conveying sacks and packages on steep inclines.

A demonstration unit, shown by the Engineering Components division, affords an indication of the effectiveness of the company's industrial disc brake. It comprises a flywheel driven by a 5-h.p. motor, and a disc brake, which, when applied, stops the flywheel in $\frac{1}{4}$ sec. and absorbs 10,500 ft.-lb. of energy.

Also exhibited are engineering components made from Duthane, a new synthetic rubber, for which exceptional resistance to tearing and abrasion, and high tensile strength, are claimed.

Accles & Pollock, Ltd., Oldbury, Birmingham. Stand No. 321, First Floor

Examples of precision, cold drawn seamless tubing in a variety of metals are being shown by this company. The exhibits include tubes with machined and honed bores, manipulated and fabricated tubing, and seamless flexible tubing and flexible joints. Thin-wall tubing in stainless steel, tubing of special cross-sectional shapes, "extended surface" tubing, and finned tubing in aluminium Magnox 12 and stainless-steel, are also being displayed.

The Yale & Towne Manufacturing Co., Wednesfield, Wolverhampton. Stand No. 54, Ground Floor

Electric hoists for handling loads up to 40 tons are being shown by this company, including a new $\frac{1}{2}$ -ton capacity unit, which weighs only 33 lb. The range of Pul-Lift equipment, for lifting and pulling, has recently been extended, and the latest additions, which are on view, incorporate link-instead of roller-type chains, and have capacities of $\frac{1}{2}$, 1 $\frac{1}{2}$ and 3 tons.

Series 51 fork-lift trucks are being shown fitted

with three new attachments, namely, a rotating head to facilitate discharging loads from bins; a side shift arrangement; and a pusher mechanism for removing loads from the forks. Fork-lift trucks are made by the firm in a variety of sizes for raising loads up to 4,000 lb. to a maximum height of 30 ft., and a high-lift type is on view. The display also includes pedestrian-controlled electric trucks of fork-lift, low-lift pallet, platform, and Worksaver tractor types.

Coventry Climax Engines, Ltd., Widdrington Road, Coventry. Stand No. 45, Ground Floor

The principal exhibits on this company's stand are fork-lift trucks from a new Universal range, with capacities for handling loads from 2,000 to 4,000 lb. Of the 4-wheeled type, these trucks are available with electric driving motors, or petrol, diesel or L.P.G. engines, and either constant-mesh gear boxes or Brockhouse torque converters.

The display also includes the latest Spacemaster type J, electric fork-lift trucks for loads of 1,500 to 2,000 lb., a type TMD 2,000-lb. capacity fork-lift truck with diesel engine drive, and a Sky-zone Economist fork-lift truck, which also has a diesel-engine drive, and is available in several sizes with capacities from 3,500 to 7,000 lb.

Stuart Davis, Ltd., Much Park Street, Coventry. Stand No. 226, First Floor

Exhibits on this stand include a new, $\frac{1}{8}$ -in. capacity, air-hydraulic drilling unit. Known as the Hydroair, this unit is of compact design, and is suitable for such operations as drilling, reaming, tapping, spot-facing, countersinking, and light-duty boring. A direct spindle drive at a speed of 700, 1,400 or 3,000 r.p.m. can be provided by a $\frac{1}{4}$ -h.p. motor. Alternatively, a belt drive arrangement may be incorporated, and variable spindle speeds from 1,100 to 3,000 r.p.m., or 250 to 2,000 r.p.m. according to the speed of the driving motor, can then be obtained.

Fitted with a Jacobs No. 2 drill chuck, the spindle has a maximum stroke of 1 $\frac{1}{2}$ in., and a power feed movement, which can be applied in either direction at steplessly-variable rates, of 1 $\frac{1}{2}$ in. Rapid power traverse in both directions is obtainable, and the movement towards the work, also the total spindle travel, are controlled positively by adjustable stops. If required, the feed movement can be stopped at any point during the operating cycle, and the spindle returned to its starting position, by depression of a push-button. The built-in controls can be arranged for right- or left-hand operation.

The Third Production Exhibition—2

Radio Heaters, Ltd., Eastheath Avenue, Wokingham, Berks. Stands No. 9 and 10, Row F

The Radyne universal shaft hardening machine, seen in Fig. 1, is shown set up for progressively surface hardening eight bands on a motor-car rocker shaft. As may be observed, the work-piece is held in a vertical position, and is rotated slowly as it passes through the induction heating head. After each band has been hardened, a rapid traverse motion is engaged to bring the next portion into line with the head, and this sequence continues until the operation has been completed. Individual adjustments are provided for varying the rates of traverse when hardening and when advancing to the next position, also for the return speed. This machine, which will admit work-pieces up to 48 in. long, can be fitted with induction generators of various frequencies and power outputs, and can be employed for hardening right up to end flanges.

Other Radyne induction heating equipment is being shown to demonstrate the extent to which costs can be reduced by means of the high-speed induction brazing process.

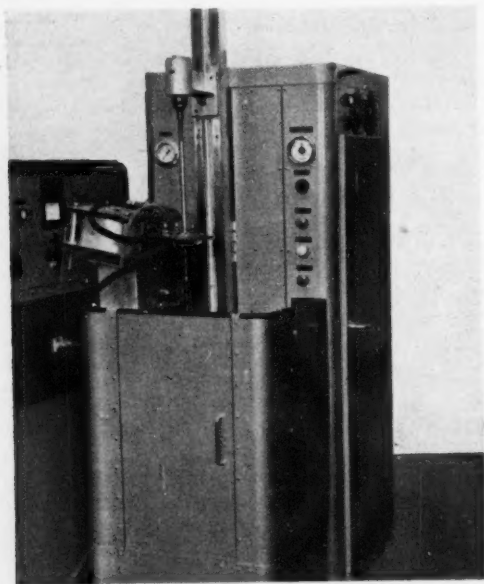


Fig. 1. Radyne Shaft Hardening Machine

The company is introducing a new rapid-cycle method of thermo-setting plastics moulding, whereby, it is stated, the curing time can be reduced considerably. This technique requires large power-output pre-heaters, to raise the temperature of the plastics preforms rapidly, and typical examples of such equipment are displayed. It is claimed that with these pre-heaters production can be increased as much as three times.

Demonstrated for the first time is a new process whereby P.V.C. material can be quilted, directly through plastics foam, to Stelvetite. The equipment employed is the new Radyne W/2P open-stand type press, which can be supplied with a generator of either 6 or 10 kW. rating, and will accept material, of any length, with a maximum width of 36 in. Other equipment on this stand is being used to demonstrate the high speeds at which small P.V.C. sheet articles can be bonded together.

Robert Speck, Ltd., Rickmansworth, Herts. Stand No. 11, Row J

The Posalux micro-drilling and copy-milling machine being exhibited by this company is intended for operation by semi-skilled labour on delicate components, and eliminates the need for jigs. This machine was described in *MACHINERY*, 86/1226—3/6/55. Two sizes are available, with work areas of 1½ by 1½ in. and 3½ by 2½ in., and holes from 0.002 to 0.187 in. diameter may be drilled, to depths ranging up to ½ in., for the larger diameters. Longitudinal and transverse adjustment of the ball bearing-mounted table, which carries the work- and template-holders, is effected by means of setting screws, and provision can be made for micrometer setting, if required.

The automatic machining cycle is initiated, and the table is clamped, when the stylus is brought into contact with the template. At the completion of this cycle, the spindle and stylus are automatically retracted, and the table is unclamped. Provision is made for automatic step-feed drilling, and it is stated that countersinking and counter-boring operations can be controlled for depth to an accuracy of 0.0001 in. Spindle speeds up to a maximum of 14,000 r.p.m. are available, and the feed motion is steplessly-variable from 0 to ⅜ in. per sec. Coolant is delivered from a built-in sump to a container at the spindle nose, which also serves to protect the tool from accidental damage

when work is being loaded and unloaded.

Another exhibit on this stand is the Centromatic face-milling and centring machine, which was described in MACHINERY, 85/686—24/9/54. This machine, which is fully-automatic, apart from loading and unloading, has a capacity of 5 in. diameter, and is built in three sizes, for workpieces having maximum lengths of 54, 90, and 120 in. The automatic work cycle is controlled by a single push-button station, and an audible signal is given when the workpiece is fully gripped by the electrically-operated self-centring vices. Alternatively, these machines can be fitted with hand-operated vices, or with special work-holding fixtures to customers' individual requirements. The self-contained heads incorporate 8/12-h.p. flange-mounted motors, and the drive is transmitted by worm gearing to the milling spindles, and spur gearing to the drilling spindles. There are eight feed rates for the milling operation, varying from 1.4 to 5.8 in. per min. A traverse screw and nut is provided for each cutter head, and drive for the feed motion, which is obtained by rotating the nut around the screw, is taken from the spindle motor. For the rapid traverse motion, of 76 in. per min., a separate motor is provided, and the screw is then rotated in the nut. Rapid advance, feed, dwell, and rapid withdrawal of the drilling spindle are effected by means of a cam contained within a housing on the front of the cutter head.

Magnesium Elektron, Ltd., 5 Charles II Street, St. James's, London, S.W.1. Stand No. 10, Row G

To draw attention to the exceptional machining characteristics of magnesium, a standard Ward No. 7 lathe is installed on this stand and turning operations are being carried out on the flanges of warp beams used in the textile industry. These demonstrations indicate that the cutting speeds possible when machining magnesium are usually limited only by the power which is available from the machine. Some specimens of magnesium alloy tooling plate are also on view.

Precision Components (Barnet), Ltd., 13 Byng Road, Barnet, Herts. Stand No. 20, Row A

In Fig. 2 are shown some examples of storage bins and assembly trays which are displayed by this company. Marketed under the name Kabi,

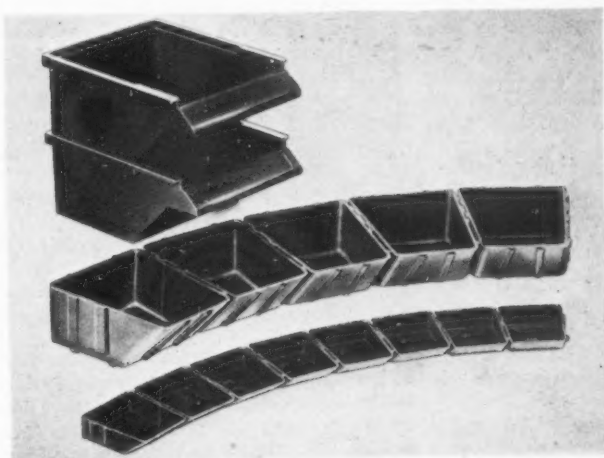


Fig. 2. Examples from the Kabi Range of Moulded Assembly Trays and Storage Bins

these units are moulded from a phenolic material, in a variety of colours. The trays have sloping fronts, and are interlocking, and the bins are so designed that they can be stacked.

At the top in the figure are seen type SB.100 storage bins which measure 7½ by 5½ by 3½ in., and in the centre, type CT.25 standard curved trays. For smaller components, there are midget curved trays, as seen at the bottom, and these, in common with standard trays, can also be supplied with straight sides.

The larger storage bins are moulded from polythene (Alkathene) material, which combines strength with resilience and resistance to corrosion.

Cementation (Muffelite), Ltd., 20 Albert Embankment, London, S.E.11. Stand No. 26, Row B

Attention has already been drawn to the Barry-mount machine levelling mount in MACHINERY, 90/998—3/5/57, and these units, which were developed and introduced by Barry Controls, Inc., Watertown, Mass., U.S.A., are now being made under licence in this country by the above company.

Intended for supporting machine tools where the transmission of vibration from the machine to the shop floor, and vice versa, must be kept to the minimum, these mounts are claimed to offer a number of additional advantages, including speed and simplicity of fitting, the fact that no fixing holes are required in the shop floor, and the latitude afforded as regards the final positioning of the machine.

The sizes range from 4% to 9% in. diameter, and for each there is a choice of four grades of Neoprene cushioning. Free heights range from 1½ to 2% in., and an adjustment of ½ in. is provided for levelling purposes. A 22-ton press and a shaping machine, mounted on these isolators, is being demonstrated on this stand, and sectioned mounts are on view, to show the method of construction.

C. A. Norgren, Ltd., Shipston-on-Stour, Warwickshire. Stand No. 16, Row C

Prominence is being given on this stand to the firm's automatic drain air filter, for separating water, oil, and dirt from compressed air supplies, and discharging the contaminants through a drain system. The latest filters are suitable for use with compressed air supplies at pressures from 5 to 200 lb. per sq. in., with pipe diameters up to 1 in.

Among other compressed air equipment on view may be mentioned pressure regulators, Oil-Fog lubricators, Mistcool coolant equipment, and the Micro-Fog system for the lubrication of bearings.

Desoutter Bros., Ltd., The Hyde, Hendon, London, N.W.9. Stand No. 11, Row H

A range of redesigned Mighty Atom and Power Atom pneumatic drills is being exhibited, and in Fig. 3 is shown the type MA 1 pistol-grip drill from the Mighty Atom series. Drills in these ranges have capacities from ⅜- to ½-in. diameter, and each incorporates a combined chuck guard and silencer, and an improved plastics grip, which is unaffected by the presence of oil and moisture on the hands. These drills are also available in the standard form, with a push-button control at the end of the handle, or with a lever-type control.

Demonstrations are being given of the full range of portable pneumatic and electric power tools,

which includes straight drills, with capacities from ⅜ to ½ in. diameter and chuck speeds from 165 to 18,000 r.p.m.; close-corner drills; screw-drivers and nut-runners; shears; rivet and bolt millers; grinders; and countersinking tools.

Among the latest developments in Desoutter die sets may be noted the 4-pillar, square type, designed to provide extra rigidity.

Bristol Repetition, Ltd., Machine Tool Division, Feeder Road, Bristol, 2. Stand No. 15, Row D

The exhibits on this stand are concerned with the design and application of the Compass Mk. VII automation base. One of these bases has been equipped with a special motor drive, and is being displayed with the table raised to an inclined position, so that the action of the indexing mechanism and synchronized camshafts can be studied. Another Mk. VII type base is shown fully toolled-up for producing a particular component on which several different machining operations are carried out simultaneously, with the aid of a number of specially-designed tool heads. The operations include drilling, milling, tapping, and slitting, and arrangements are made for automatically ejecting the component at the end of the machining cycle. Standard units, such as bench drills, can also be used in conjunction with Compass automation bases, so that tooling set-ups can be assembled from equipment which is available in the normal workshop, and a number of photographs are being displayed, showing examples of such assemblies.

Another machine on view has been toolled up for carrying out a number of operations on an injection-moulded component. These operations include tapping, slotting, piercing, and grooving, and provision is also made for automatic loading and unloading.

Sandvik Swedish Steels, Ltd., Manor Lane, Halesowen, Birmingham. Stand No. 8, Row J

This company's exhibits include examples from the Coromant T-max range of holders for use with throw-away tungsten carbide tool tips.

Available in right- and left-hand forms, with a 6-in. long shank of 1 by 1 or 1½ by 1½ in. cross-section, the holder is fitted with a removable chip breaker which has a serrated top surface whereby it can be set in three positions in relation to the cutting edge, according to the turning feed rate to be employed.

The design is such that when the clamp is released for removing the tool tip, the chip breaker is held in contact with its lower surface by a spring-loaded plunger. With this arrangement, there is

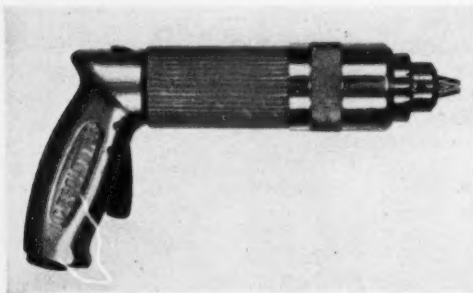


Fig. 3. Desoutter Mighty Atom Type MA 1 Pneumatic Drill

less risk of the chip breaker becoming accidentally detached from the holder when the tip is being changed or indexed. The holder is fitted with a tungsten carbide, seating plate, with chamfered edges, for supporting the tool tip, and the clamping screw has a socket at both ends to receive a key. Different types of holders are available for use with square and triangular tool tips, which are supplied in compact spring-loaded dispensers.

The Coromant "combination" milling cutters on view are made in diameters from 4 to 16 in., and incorporate detachable tungsten-carbide tipped blades which can be set at different angles and heights in slots in the body, for performing face, square shoulder and step milling operations on steel, cast iron and non-ferrous metals. Each blade is secured by two socket head screws, fitted with steel balls which can swivel freely and have ground flat contact surfaces. A feature of the cutter is that the blades can readily be removed from the body and ground separately, by the off-hand method, on a conventional tool grinder. Subsequent re-setting of the blades is carried out with the aid of a jig and setting pieces. In addition, in the event of one of the blades becoming chipped, it may be removed from the body for re-grinding without disturbing the remainder.

Attention may also be drawn to the Coromant tungsten-carbide tipped steel end mills which are available in two designs. One, designated type S26, is intended for square shoulder milling, and the other (type S27), which has a 60-deg. approach angle, for heavy-duty face milling.

Surfard, Ltd., Abbey House, 2 Victoria Street, London, S.W.1. Stand No. 18, Row D

Three examples from the German-made Peddinghaus range of flame hardening machines, which the company distributes in this country, are being shown in operation.

These machines, several of which have already been described in MACHINERY, are available in different designs for handling a variety of components on semi- or fully-automatic cycles, and they are particularly intended for installation in production lines. Heating of the work is effected by a mixture of town gas and oxygen, and accurate temperature control is obtained by means of a Milliscope photo-cell unit.

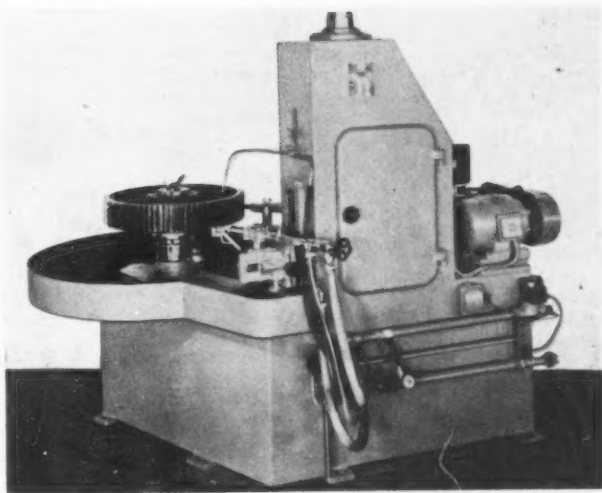


Fig. 4. Peddinghaus Type ZV.1000 Flame Hardening Machine for Large-diameter Gears

Flame hardening of ball joints at the rate of 200 per hour is being demonstrated on a type TU machine, which incorporates an indexing table and has provision for rotating the work. At the end of the heating stage of the cycle, a signal is transmitted by the Milliscope unit, which causes the table to be indexed for transferring the work to the quenching position. Alternatively, the table can be indexed by hand, or automatically in conjunction with a timer. If required, the mechanism for rotating the work can be disengaged, so that local flame hardening can be carried out on parts such as rocker arms.

The type ZV.1000 machine, illustrated in Fig. 4, is intended for automatically flame hardening the teeth of spur and helical gears up to 72 in. diameter, with pitches down to 5 d.p., also bevel gears. For the operation, the gear is secured to a vertical, indexing spindle, and heating and quenching of both flanks of a tooth are undertaken progressively, movement of the combined burner and quenching head on the column being controlled by a cam. At the end of the operating stroke, the flame is extinguished, and the speed of the driving motor is then increased in the ratio of 2 to 1 for indexing the gear to bring the next tooth to the working position, and for rapidly returning the burner and quenching head to the lower end of its travel. Thereupon, the flame is automatically ignited and the next working cycle is started. When all the teeth on the gear have been heat-

treated, the machine is automatically stopped. As an example of the productive capacity of the machine, it is stated that a 33-in. diameter gear which has 90 teeth and a face width of 3½ in. can be treated in a floor-to-floor time of 80 min.

Intended primarily for the progressive flame hardening of external surfaces on components up to 5 in. diameter by 28 in. long, also the bores of hollow parts, the type S11/TZL machine is shown fitted with a special attachment which enables larger workpieces to be handled. With this set-up, the flame hardening of a 30-in. diameter crane sheave is being demonstrated. The work is rotated at steplessly-variable speeds, which can be closely controlled, by a motor drive, and provision is made for traversing the combined heating and quenching head on the column ways.

Spencer, Franklin, Ltd., 11 London Bridge Street, London, S.E.1. Stand No. 2, Row C

Attention may be drawn to the PowRock air-hydraulic clamping equipment shown in Fig. 5, which the company will shortly start to make in this country, under licence from the U.S.A.

The clamping heads take the form of hydraulic cylinders with hollow rams which have a ¾-in. bore. Pressure fluid is delivered to the heads by an air-hydraulic "booster" cylinder which is connected, by way of a lever-operated control valve, to a compressed air supply. Each head enables a clamping force of 5,700 lb. to be applied to the work, and they are available in two sizes, the smaller of which has an overall length of 2 in. and a working stroke of ⅞ in. The overall length of the larger unit is 3½ in., and the ram travel, ½ in. Two large clamping heads, or three of the smaller size, may be connected to a single booster cylinder. When larger numbers of clamping heads are required, additional booster cylinders, arranged for operation by a single control valve, may be employed.

Since the clamping cylinder has a hollow ram, it may be passed over the bolt for a finger-type clamp for example. A nut on the bolt is then adjusted to restrict the travel of the ram to about ¼ in. When pressure fluid is delivered to the cylinder, the ram is moved upwards into contact

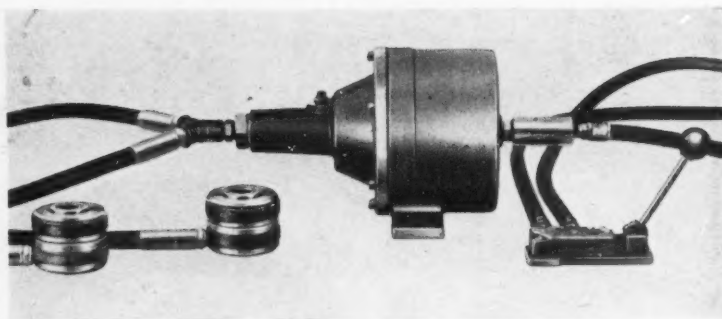


Fig. 5. PowRock Air-hydraulic Clamping Equipment

with the nut, and the pressure is applied to the clamp by the body, for positively holding the work.

Another exhibit of interest is the Milomatic air-hydraulic machine vice, which will exert a maximum clamping force of 9,000 lb. In operation, movement of the sliding jaw is effected hydraulically, pressure fluid being delivered through a flexible tube from an air-hydraulic booster cylinder.

The Microball micrometer height gauge, handled by the company, also the Hydroclamp work positioning equipment and the Sevo multi-jaw vice, are on view.

Electronic Gauges, Ltd., Hartfield Crescent, Wimbledon, London, S.W.19. Stand No. 25, Row H

On this stand are being shown some examples of the electronic sizing units for cylindrical grinders, also the electronic comparators, developed by the French firm Électronique Appliquée à la Mécanique, for whom the company are the sole concessionnaires in this country.

Of particular interest is a Stop Cut unit which enables the diameter of a cylindrical part to be automatically controlled, while grinding is in progress, so that a predetermined fit is obtained when it is mated with a previously-finished female part. Reference to this equipment, fitted to a French-built Gendron cylindrical grinder, was made in MACHINERY, 91/26—5/7/57.

The Micro-Mate sizing unit, which is also on view, is intended for use on cylindrical grinders with hand-controlled in-feed movements.

Nickols Automatics, Ltd., 7 Carlisle Road, London, N.W.9. Stand No. 12, Row J

A Herbert No. 2 capstan lathe, which has been converted for fully automatic operation by the installation of the company's sequence control equipment, is being shown on this stand.

With this equipment, full details of which were published in *MACHINERY*, 92/87—10/1/58, the various motions of the machine elements are effected by air cylinders, in conjunction with hydraulic check cylinders, which provide for stepless adjustment of the cross slide and turret slide feeds. Other movements that may be performed automatically during the working cycle include opening and closing of the chuck, and engagement of the different spindle speeds and mechanical feeds that are available on the lathe. These motions are initiated electrically, and an important feature of the system is that the sequence of operations required for producing a particular component can quickly be pre-selected, by means of plugs which are inserted in sockets incorporated in a compact control unit.

Talbot Tool Co., Ltd., Grip Works, Roedale Road, Brighton. Stand No. 11, Row F

Reference was made in *MACHINERY*, 92/1058—9/5/58, to the range of Polygrip drill bushes which are made by this company for use in conjunction with plastics and moulded jigs. Examples of these bushes, and selections from the Grip range of hardened and ground steel drill and reamer bushes, are shown in Fig. 6. The company's products also

include toolmakers' buttons, and lock screw locating and clamping screws, and these are exhibited, together with a number of Nurogrip straight-serrated bushes for use with laminated jigs.

Books Received

Mechanical World ELECTRICAL YEAR BOOK, 1958. Emmott & Co., Ltd., 31 King Street West, Manchester, 3. [Price 3s. 6d.—by post, 4s. 2d.]

In view of the growing importance of electronics, the relevant section of this year book has been considerably extended to include, for example, information on amplifiers, time-delay circuits, gas-filled valves, motor control, and oscillators.

B.E.M.A. ENGINEERING DIRECTORY. The Bristol & West of England Engineering Manufacturers' Association, Ltd., 16 St. Stephen's Street, Bristol, 1.

The 19th edition of this annual directory and buyers' guide includes notes on the Association; alphabetical lists of full members, associate members, and associates; a section on products and services; and a classified index of trades. The products and services section gives brief details of the activities of the various companies and illustrations of typical products.

WATCH AND CLOCK YEARBOOK, 1958. N.A.G. Press, Ltd., 226 Latymer Court, Hammersmith, London, W.6. 144 pp. [Price 3s. 6d. 2s. to members of the British Horological Institute.]

In addition to numerous articles of interest within the field, this yearbook includes the names and addresses of firms in the horological and allied trades; a directory of trade names of horological and allied products and a list of materials dealers. Useful information is presented in tabular form, including particulars of American and Swiss watch screw threads.

PLANSEEBERICHTE FÜR PULVERMETALLURGIE. In the December, 1957, number of this publication, which is issued by Metallwerk Plansee, G.m.b.H., Reutte/Tirol, and distributed in this country by Metro-Cutani, Ltd., Grappenhall, Warrington, Lancs., there are four main articles. The first, entitled silicoborides of the transitionary metals, vanadium, niobium, tantalum, molybdenum, and tungsten, was prepared by H. Nowotny, R. Kieffer and F. Benesovsky. Binary and ternary phases with carbon, boron, nitrogen and oxygen, and the methods of production are discussed.

The next article, contributed by P. U. Gummeson and L. Forss, is concerned with sintered steel-copper-graphite materials. Relationship between hardness and the time and duration of sintering, also composition, is indicated by curves. Variation of density with composition is similarly indicated. Another article, by H. Nowotny, R. Kieffer, F. Benesovsky and E. Laube, gives information on the uranium-carbide/thorium-carbide system. In the final article, by R. Kieffer and K. Sedlatschek, which is fully illustrated with photo-micrographs, the powder metallurgy of uranium alloys produced by the impregnation method is discussed at considerable length.



Fig. 6. Talbot Standard Drill Bushes from the Polygrip and Grip Ranges

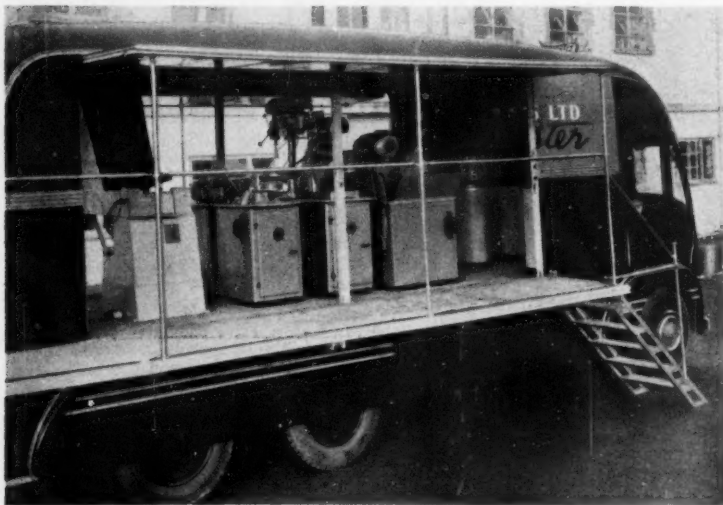
News of the Industry

Manchester and District

LESS OVERTIME AT THE FOUNDRIES.—The amount of overtime being worked at the Lancashire foundries is much less than it was a year ago. On the whole, however, the position in the foundry trade is no worse than it has been in recent months, and there are reports from some quarters of a slight improvement. The call for supplies from the Derbyshire and Staffordshire blast furnaces is steady, and all requirements are met without difficulty. Derbyshire No. 3 pig-iron is quoted for delivery in the Lancashire zone at £21 1s. 3d. per ton, and West Coast haematite pig-iron, for which there is a moderate demand, is offered at £25 5s. per ton, delivered Manchester. There is a steady movement of finished iron, including crown and best bars.



This van has recently been equipped by Impregnated Diamond Products, Ltd., Tuffley Crescent, Gloucester, for the purpose of demonstrating their Neven diamond impregnated tools for various industries. Eight different machines are installed for performing such operations as cutting and grinding tungsten carbide, glass, ceramics, quartz, germanium, and refractories. The van is completely self-contained and during this year it will travel in industrial areas throughout the country



QUIETER DEMAND FOR STEEL MATERIALS.—Although fresh business in steel materials remains quieter than it was some time ago, customers, with few exceptions, are drawing steadily on contracts. The greatest activity is in connection with steel plate, large-diameter bars, special alloy steels and semi-finished materials, and the heavy electrical engineering, heavy machine tool, wire-drawing and forging trades are still among the leading customers.

BARBER & COLMAN, LTD., Marsland Road, Brooklands, are experiencing a steadily maintained demand, from home and Continental customers, for their various sizes and types of gear hobbing machines, and cutter and hob sharpening machines. A steady business is also reported in ground and unground hobs for cutting gears, ratchet wheels, chain wheel sprockets, splines, and serrations. Activity is fully maintained in the departments producing Shakeproof locking washers and thread-cutting screws.

EDWARD HOLME & Co. (1931), LTD., Moss Lane, Altrincham, are fully occupied with the production of a variety of electrical control panels and switchboards for projects both at home and overseas. Work is in progress on the large contract for low-tension control gear for the Mercer power station,

Auckland, New Zealand, and on several change-over contactor panels for emergency lighting purposes. In addition, we may note that hand and automatic control gear, brakes, and solenoids, are on order for a variety of industrial applications, such as large motors, heavy cranes, oil refinery equipment, hydro-extractors, pumps, air compressors, and refrigerators. Structural alterations are being carried out in the firm's die-casting foundry with a view to modernizing the lay-out. Orders are steadily maintained for

die castings in aluminium, aluminium-bronze and brass.

NORTHERN AUTOMATIC SCREW CO., LTD., Golf Road, Hale, Altrincham, continue to work day and night to meet the heavy demand for standard and special screws, and repetition turned and threaded components. Since our last visit, the works have been extended to provide increased shop floor space and a new canteen, and additional C.V.A. single-spindle automatics and Wickman 6-spindle bar automatics of 1-in. and 1½-in. capacities have been installed. There is a heavy demand from the motor car, aircraft and general engineering industries for threaded components, and other work includes conveyor chain components and high-pressure hydraulic pipe-line fittings.

Our attention was drawn to the firm's Nascol brand Scru-bushes which have been developed to provide adequate tapping depth in sheet metal. Bushes are available in brass or steel, and with all standard British, American and Unified threads. The design of the hexagonal head on the bush ensures six point penetration of the sheet and prevents rotation of the bush. Assembly is simple and rapid, and it is claimed that the final fastening is positive, permanent, and vibration-proof. The smaller diameter of the internally-threaded bush is inserted into the punched or drilled sheet and the inner end spun or riveted over, prior to insertion of the fixing screw.

LOCKERS (ENGINEERS), LTD., Warrington, have supplied a folder describing their range of electric vibrating feeders for controlling the handling of any quantity of material from a few pounds to 2,000 tons per hour. Feeders are available of small, medium, and large capacity, also flameproof feeders for use in dangerous atmospheres. A vibratory power unit, attached to the feeder deck at a slight angle, imparts forward and upward impulses, and has the effect of moving the material in a continuous series of rapid, short, forward hops. Small feeders are available for use with vibrating hoppers.

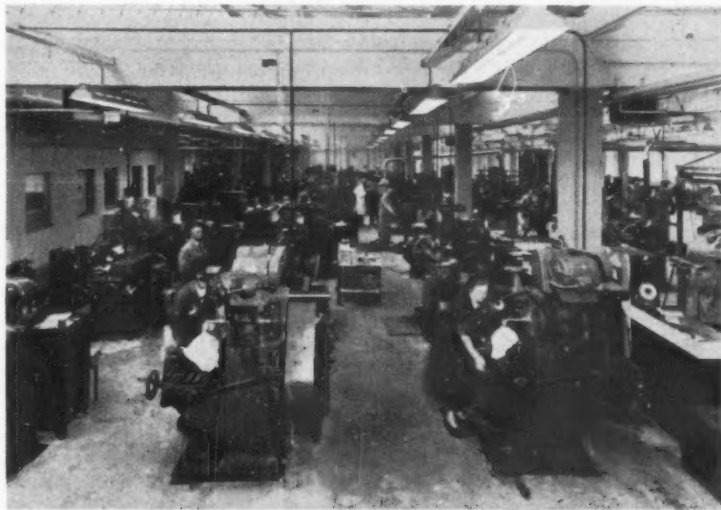
THOMAS ROBINSON & SON, LTD., Rochdale, have recently received an order for the equipment required for a new flour mill and stock food plant which is to be erected in Queensland, Australia. The order covers milling and wheat cleaning machinery, together with pneumatic conveying systems, and sheep and cattle food cubing machines. Some 80 cases of milling machinery, which were recently dispatched from these works to Birkenhead for shipment, formed the first consignment of equipment for the 1,000,000-dollar mill which is being built in the Philippines for Republic Flour Mills, Inc.

CRAVEN BROTHERS (MANCHESTER), LTD., Reddish, Stockport, have recently built a 150-in. high-speed precision gear hobbing machine, for turbine reduction gears, for Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, which is capable of speeds up to five times those generally associated with such work. The machine is of the moving column and fixed table type, and will hob spur and helical gears from 57 to 150 in. outside diameter and with face widths up to 48 in.

H. B.

The Midlands

GEORGE WALKER & SONS (BIRMINGHAM), LTD., 837 Warwick Road, Birmingham, 11, report that orders for their extensive range of high-speed steel



Part of the Milling Cutter Production Department in the new Works of George Walker & Sons (Birmingham), Ltd.

milling cutters are maintained at a very satisfactory level. Large stocks of standard cutters are carried in the extensive stores, and special cutters can usually be supplied at short notice. The illustration on page 1181 shows part of the milling cutter production department in the new works, to which the company moved during 1957. Covering an area of 26,000 sq. ft., these premises occupy an easily accessible site, and house all departments of the firm under one roof. The heat treatment facilities are of a high standard, and good working conditions have been provided throughout the factory.

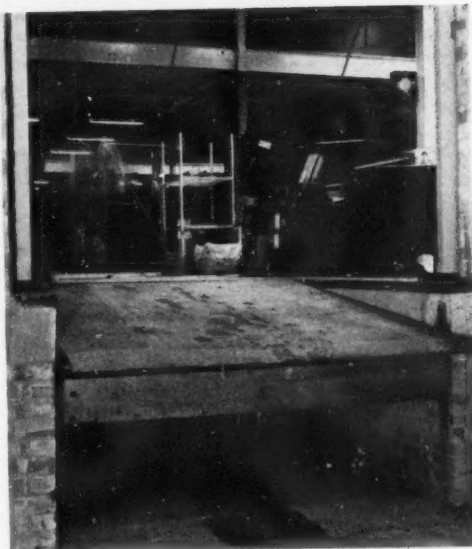
EDWARD J. SKINNER, LTD., Lode Lane Factory Estate, Solihull, Warwickshire, are still busy, and are at present occupied with the construction of several special-purpose machines incorporating Skinner unit heads, which are suitable for high-speed drilling and tapping operations. Also in progress is a compact orbital transfer machine, built in the form of a hollow square, with 11 work stations and a number of special-purpose heads, which will enable 70 machining operations to be performed on a component in a cycle time of 20 sec. Plans have been approved for extending the existing works, and the production facilities will thus be greatly improved.

L. & T. I. BROCK & Co., LTD., Stephen Street, Coventry, advise us that they are receiving orders from an increasing number of firms for rollers and pins for roller bores, which are available from stock in many sizes and types, and can usually be dispatched by return of post. Rollers are made from tool steel, hardened to 60-62 Rockwell C., and are paired with pins of similar material. All components are made to close limits, and in this connection it may be pointed out that the outside surfaces of rollers are held concentric with the bores within 0.0002 in. total indicator reading. Arrangements are being made to introduce a range of cam follower roller assemblies fitted with needle rollers.

F. W. H.

Wayne-Dock-o-matic Tilting Ramp

In various factories the handling facilities at loading and off-loading bays have been designed or modified to include Wayne Dock-O-Matic hydraulically-operated tilting ramps, to facilitate the passage of goods between vehicles and stores, especially when fork-lift trucks are employed. In some factory loading bays the difference in height between the floor of a lorry and the edge of the dock is sufficient to hamper the manipulation of heavy or bulky packages. The Wayne ramp, provides a means of bridging the gap between the



Wayne Dock-O-Matic Hydraulically-operated Tilting Ramp for Loading Docks

two levels with an inclined platform, so constructed that it will automatically adjust itself to variations in the height of the lorry floor during loading or unloading operations.

The general arrangement of the tilting ramp can be seen in the accompanying illustration, which shows the platform inclined downwards to the full extent. A hydraulically-operated ram, seen in the foreground, controls the movement of the platform, which is hinged along its rear edge to the vertical face of the loading bay. The ramp takes the form of a non-skid decking plate supported on a steel framework which measures 8 ft. long by 6 ft. wide. Secured to the under-side of the framework is an electrically-operated hydraulic pump, connected by flexible tubing to the ram, which will raise or lower the edge of the platform through a maximum distance of 22 in. Limit switches in the hydraulic pump control circuit provide for the automatic adjustment of the height of the front edge of the platform while it rests on the decking of a vehicle in the loading bay. A main selector switch, which serves to control the rise and fall of the platform, may be fitted in any convenient position adjacent to the dock. The complete ramp installation weighs 15 cwt. and is suitable for loading docks not less than 36 in. or more than 50 in. high. Under working

conditions, the maximum gradient of the ramp should not exceed 1 in 10, and it will support rolling or static loads up to 20,000 lb.

The complete equipment is made and marketed by the Wayne Tank & Pump Co., Ltd., who recently occupied new works and offices at Western Road, Bracknell, Berkshire.

Stainless Steel Rolling Facilities

Extensive additions to the Sheffield works of Shepcote Lane Rolling Mills, Ltd., have now been completed at a cost of more than £1,500,000, with the result that the output capacity has been increased by more than 50 per cent. The main alterations have been to the hot rolling mill, which, in its original form, rolled slabs up to 1,400 lb. weight down to 60-ft. long coils of stainless steel strip.

As a result of the modifications, the mill is now capable of handling slabs up to 8,000 lb. weight, and of rolling stainless steel strip, up to 41½ in. wide, in lengths of 350 to 400 ft., and thicknesses down to 0.10 in. Conservation of heat to permit of rolling these lengths has been achieved by the adoption of the hot Steckel principle of rolling, coiling furnaces being installed on either side of the hot finishing mill.

A third softening and descaling line and a new skin-pass mill have also been provided, and the slab-grinding equipment and the strip-grinding line have been modified.

Shepcote Lane Rolling Mills, Ltd., is a subsidiary of Firth-Vickers Stainless Steels, Ltd., in which Samuel Fox & Co., Ltd., have a one-third interest.

Open Days at M.E.R.L.

New and extensive facilities for research into mechanisms and metrology and heat transfer are now available at the Mechanical Engineering Research Laboratory D.S.I.R. at East Kilbride, near Glasgow, where June 4 and 5 will be open days.

The metrology section is believed to be the best equipped of its kind in the world, and it provides a service to industry and other Government Departments, including the remainder of the Laboratory, for a wide range of precision engineering measurements. All exterior windows are double-glazed and fitted with venetian blinds, and the test rooms are surrounded by a temperature-controlled corridor. Each test room is supplied with air at the standard temperature of 68 deg. F. through a system of ducting concealed in a false ceiling. The standards room has a thick concrete base resting on a rubber mat, so that vibration from other

areas will not disturb sensitive measurements.

Facilities in the Heat Division's new laboratory include large experimental bays and smaller physics-type laboratories. In order that research may be carried out effectively, it has been necessary to provide sources of heating and cooling on a large scale. A total power (A.C. and D.C.) of 1,750 kVA. is available, and the voltage of a large proportion of the A.C. supply can be remotely controlled to give a smooth variation from zero to the full output value. A DEUCE digital computer is being installed, primarily for the Division's work on the preparation of tables of thermodynamic properties of technically important fluids.

The work of all other Divisions will also be on show, and is concerned, for example, with the growth of fatigue cracks in metals (Materials Division), and investigations into the hot extrusion of rods in a hydraulic press and the cold impact extrusion of rods and tubular containers in a crank press (Plasticity Division).

Visitors will also have an opportunity to see the work of the Lubrication Division at Thornton-hall, where current investigations include research into air-lubricated bearings running at speeds up to 100,000 r.p.m.

Production Engineers' Conference

At the 1958 Midlands Region one-day conference, organized by the Institution of Production Engineers (Birmingham Section), the theme was "Machining—Tomorrow's Productions." The conference was held in the new administration building of Cincinnati Milling Machines, Ltd., Kingsbury Road, Tyburn, Birmingham, on May 7, and during the morning three papers dealing with modern machining techniques were presented. There was also an address by the Earl of Halsbury, President of the Institution, who spoke of the need for close co-operation between mechanical, electrical, and electronic engineers in the design of new machine tools.

A paper on "Machining the Unmachinable" was presented by Mr. A. R. Hambidge, Cincinnati Milling Machines, Ltd., who dealt with methods adopted for machining hard materials. Reference was made to the technique of "hot machining," in which the workpiece is induction-heated locally ahead of the cutting tool to reduce its resistance to shear, and it was stated that, in general, with high-strength aircraft alloys, as the workpiece temperature was raised, tool wear decreased. Mr. Hambidge went on to discuss electro-discharge machining, and showed a film of the process taken at a speed of 7,000 frames per sec., which enabled

the individual electrical discharges, and the resulting debris and gas swept away by the flow of dielectric fluid, to be observed. Mr. O. S. Puckle, E.M.I. Electronics, Ltd., delivered a paper on the "Numerical Control of Machine Tools as an Aid to Production," in which he described the advantages of numerical control with particular reference to the analogue system. A paper entitled "Chipless Machining" by Mr. A. G. Cochrane and Mr. A. Powell-Tuck, both of Hordern, Mason, & Edwards, Ltd., was concerned with the Cincinnati Hydrosin and Hydroform processes which have been fully described in MACHINERY.

The afternoon was devoted to a tour of the Cincinnati works, which, as a result of recent expansion programmes, are among the most modern of their kind in this country. An article concerned with the new administration building and the factory layout appeared in MACHINERY, 92/48—3/1/58.

M.T.T.A. Guide

The Machine Tool Trades Association, Brettenham House, Lancaster Place, London, W.C.2, have issued a guide to the activities of their members which should be of great assistance to purchasers of machine tools and allied equipment. Extending to 330 pages, the guide is in four languages (English, French, German and Spanish), and is well presented and arranged.

In the first section, products are listed alphabetically, with suitable sub classifications where necessary, for instance, for lathes and grinding machines. Against each type or sub-type of machine, code numbers are included, indicating the makers and agents or importers. The next section comprises a directory of members of the Association, also arranged alphabetically, with a code number for each entry and an indication as to whether the company is a manufacturer, an agent or importer, or both. Information includes postal and telegraphic addresses, telephone numbers, and, as appropriate, addresses of works and U.K. branch offices, particulars of overseas representation, and details of foreign agencies held. This section affords striking evidence of the breadth of activities of member companies and of the need for such a guide whereby so much information is so readily presented.

Finally, there is a section of trade names, again accompanied by members' code numbers. A useful feature is the indication of the country of origin of each item.

Copies of this publication can be obtained on application to the Association at the above address.

Automation for Small-quantity Production

(Continued from page 1131)

entire installation operates under tape control, and is so arranged that four different parts can be in production. A separate tape controls all the operations on a particular component and there are four tape readers. In operation, the different parts pass down the machine line in succession, and at any given time three tape readers are in use, and a different part is being machined at each of the three stations. Within the capacity of the tooling that can be accommodated on the machines at one setting, moreover, other parts can be put into production merely by changing one or more of the tapes and the corresponding work holding fixtures.

It will be appreciated that, with such a system, the number of machines in the line need not be limited to three, nor the number of tape readers to four. At least in theory, therefore, a considerable number of different parts could be produced without any change of set up, provided that they were selected to come within the capacity of one set of tooling.

Various firms in this country have been active in the development of automatic control systems, and it now remains for machine tool builders, with the full collaboration of the users, to ensure that the potential advantages of such systems are turned to the widest practical account with the minimum of delay. Automation of small and medium quantity manufacture would be of particular importance to British industry, and the means are at hand.

Maxam Colour Film

The Maxam Division of the Holman Group of Companies, Camborne, Cornwall, has produced a colour film which is being shown at the Production Exhibition, Earls Court, until May 21.

This film starts with a review of some of the methods employed for the manufacture of Maxam valves, cylinders, and solenoids, and continues with demonstration layouts which show various items of this equipment in operation. A number of typical engineering applications of the company's air-operated equipment is included, with particular emphasis on those instances where production rates have been increased considerably. Reference may be made, for example, to a standard Cincinnati milling machine which has been equipped with air cylinders for simultaneously clamping six electrical junction boxes for a face-milling operation, and to a complex air-operated conveyor system which has been installed by a well-known electrical firm in connection with the high-quantity production of thermostats for motor car heating systems.

In the field of mining and quarrying, the company's equipment is shown applied to the control of the hopper doors of a large stone-chip storage installation.

Industrial Notes

ELGAR MACHINE TOOL CO., LTD., 172-178, Victoria Road, Acton, London, W.3, have been appointed sole distributors in the United Kingdom for the GLP.70 precision boring and milling machine.

MURRAY'S (PRETORIA) ENGINEERING CO., LTD., inform us that they are increasing the size of their factory at Pretoria Road, Romford, Essex, where they will concentrate on the manufacture of standard jig parts and small tools.

CLARKSON (ENGINEERS), LTD., Nuneaton, report that, in spite of the prevailing trade conditions on the American continent, their Canadian subsidiary is making good progress with the sales of Autolock and Dedlock milling chucks and cutters.

ROZALEX, LTD., 10 Norfolk Street, Manchester, 2, have introduced an improved dispenser for their barrier cream. To ensure greater cleanliness it is chromium plated both externally and internally, and a locking device, with removable key, is incorporated in the lid.

EKCO ELECTRONICS, LTD., Ekco Works, Southend-on-Sea, and GEORGE KENT, LTD., Luton, are now offering their joint services for the contracting, engineering, and manufacture of overall instrumentation schemes for both power and research atomic reactors.

CRODA LTD., Snaith, Goole, Yorks, have formed a new company, Croda Belge, with head offices at Verviers, Belgium. This company will serve the Northern part of the European market and will specialize in the manufacture of lanolin.

FEDERATION OF BRITISH HAND TOOL MANUFACTURERS, Light Trades House, Melbourne Avenue, Sheffield, 10. Copies of the second edition of the Buyers' Guide to the Hand Tool Industry, published by the Federation, are now obtainable from the secretary at the above address, price 2s. 6d. each (including postage).

THE 1958 CYCLE AND MOTORCYCLE SHOW will be held at Earls Court, London, from November 15 to 22. It is stated that space applications by members of the British Cycle and Motorcycle Industries Association, together with requests from outside firms and organizations, have substantially exceeded those for the last Show, held in 1956.

REMINGTON RAND, LTD., have established a new Business Services Division under Mr. C. W. Elliott, which comprises the former Univac Electronic Computer Division, and an Organization and Methods Services Department. The offices of the new Division will be at 26-40 Kensington High Street, London, W.8.

B. ELLIOTT (MACHINERY), LTD., have appointed Wickman, Ltd., Coventry, as sole distributors in the United Kingdom and Eire for their Victoria Victomatic 0-18 and 2-30 automatic cycle milling machines, as from June 1. These machines have table sizes of 36 by 10½ in. and 50 by 10 in.

BIRLEG, LTD., Tyburn Road, Erdington, Birmingham, are forming a branch organization in Canada to supply furnaces and other equipment to the engineering and metallurgical industries. Mr. Brin Evans, who will be in charge of this organization, will shortly be established in Toronto.

BTR INDUSTRIES, LTD., Herga House, Vincent Square, London, S.W.1, have introduced a new type of rubber industrial safety boot, specially designed to prevent injuries caused by nails, glass and similar sharp objects penetrating the sole. The main feature of this Armasol boot is a tempered-steel spring plate, which is anchored firmly between the insole and outsole by a new bonding process.

THE SOCIETY OF BRITISH AIRCRAFT CONSTRUCTORS report that the export total for the first quarter of 1958, at £36,328,552, exceeded the annual export total for any year up to and including 1950. It represented an increase of 50 per cent over the 1957 January/March figure, and 24 per cent over the equivalent 1956 total which was hitherto the highest for the period.

PROFESSIONAL AND EXECUTIVE REGISTER.—It is reported by the Ministry of Labour and National Service that during the first year of operation, some 3,000 men and women in the professions and in business management have been found employment by the Professional and Executive Register. Information about the special service provided, and the addresses at which the registers are held, can be obtained from any local office of the Ministry.

UDDEHOLM, LTD., have established a Tool Division which will be concerned with the sale and development of small tools for production engineering, with emphasis on the application of Uddia hard metal to such components as tips, tools, dies, rolls, tube mandrels, sand blast nozzles, and wear resisting parts. The manager of this new division is Mr. A. H. Mills, A.M.I.Mech.E., A.M.I.Prod.E., and the headquarters are at Crown Works, Northwood Street, Birmingham, 3.

APPLEBY-FRODINGHAM STEEL CO., a branch of The United Steel Companies, Ltd., 17 Westbourne Road, Sheffield, 10, have placed an order valued at more than £500,000 with Davy & United Engineering Company, Limited, for the supply of a new slabbing mill. It is expected that this 45-in. mill will come into operation towards the end of 1959. It will be equipped with universal manipulators, and the associated roller tables are included in the order.

THE INSTITUTION OF ENGINEERING DESIGNERS, 38 Portland Place, London, W.1, announce that the 1958 Lord Westwood Memorial Lecture will be delivered by Mr. Hugh Clausen, O.B.E., I.S.O., B.Sc. (Eng.), at Manson House, 26 Portland Place, on June 12, at 6.30 p.m. The subject will be "engineering design—the background and basis of contemporary life." Admission will be by invita-

tion, and members and non-members who wish to attend should apply to The General Secretary, at the above address.

SURFORM TOOLS.—In *MACHINERY*, 92/897—18/4/58 and 92/984—25/4/58, reference was made to Surform tools which are marketed by Simmonds Acroccessories, Ltd., and it was stated that the blades for these tools were supplied by Firth Brown Tools, Ltd. We are asked to point out that whereas these blades were invented by Firth Brown Tools, Ltd., they are being made and supplied by Firth Cleveland Tools, Ltd., of Wolverhampton and Tipton.

PALMER AERO PRODUCTS, LTD., Herga House, Vincent Square, London, S.W.1, announce that they are now able to supply British-made dispersion polymer PTFE hydraulic hoses. Marketed under the name of Palmer Fluoroflex, these hoses are made from a new fluorocarbon resin compound and are provided with an outer covering of stainless-steel wire braid. Suitable for pressures ranging from 1,000 to 10,000 lb. per sq. in., they can be used for carrying solvents, hydraulic fluids, and acids, are non-flammable, and can withstand prolonged flexing and vibration. A range of swaged-on or re-usable end fittings is also available.

J. A. CRABTREE & CO., LTD., Walsall, Staffs., will hold an exhibition of their products at the Grand Hotel, Charing Cross, Glasgow, from May 19 to 24. The display will include various types of air-break contactor gear, manual starters, limit switches, and auxiliary equipment, also control panels and equipment which incorporate their products and demonstrate the wide range of applications for which they are suitable. Miniature circuit breakers, and the new range of Closegang assemblies will also be shown. Tickets for admission to this exhibition are obtainable from J. A. Crabtree & Co., Ltd., 80, Blythswood Street, Glasgow, C.2.

INDUSTRIAL SAFETY TRAINING CENTRE, Summer Road, Acoc's Green, Birmingham, 27.—It was recently announced that, during the past year, more than 300 different industrial undertakings from all parts of the world have sent students to courses at the Centre, and that the total number of students attending has exceeded 1,400. In 1957, 40 courses were held, for example, for: power press tool setters and allied employees; foremen, supervisors, etc.; electrical installation, repair, and maintenance; industrial truck, fork-lift truck, and other drivers; part-time safety officers; maintenance workers; crane drivers and slingers; and engineering apprentices.

RESEARCH & CONTROL INSTRUMENTS, LTD., is the title of a new company which is now the sole distributor in the United Kingdom for the electronic instruments and scientific equipment hitherto marketed by Philips Electrical, Ltd. (Research and Control Instruments Division). In addition, it will distribute in Britain the following: industrial X-ray equipment by C. H. F. Müller A.G., Hamburg; X-ray diffraction and spectrographic equipment by Norcelco, U.S.A.; electronic measuring instruments and electro-chemical apparatus by Mullard Equipment, Ltd.; and electronic instruments by Elektro-Spezial A.G., Hamburg. The address of the new company is Instrument House, 207 King's Cross Road, London, W.C.1 (telephone number, Terminus 8444).

TRAINING SCHEME FOR OFFICERS.—Associated Electrical Industries, Ltd., Crown House, Aldwych, London, W.C.2, have organized a training scheme for officers leaving the services as a result of recent defence cuts. Prepared in conjunction with the Officers' Association, on behalf of the Regular Forces Resettlement Service, it provides a two-year course for between 110 and 180 officers over the next 4 to 5 years. The scheme has been designed primarily to equip officers with no technical qualifications for employment in the electrical engineering industry. A.E.I. cannot guarantee to employ all who undergo this training, although every effort will be made to do so. Applications for training should be made to the Officers' Association, Windsor House, 46 Victoria Street, London, S.W.1, or to any local office of the Ministry of Labour and National Service, and not to A.E.I., Ltd., direct.

THE BALFOUR GROUP OF COMPANIES, Artillery House, Artillery Row, London, S.W.1, inform us that work has now started on their £130,000 research and development centre at Leven, Scotland. The object of the centre is to carry out development work in connection with the design and operation of chemical process plant for many industries, also the applications of new constructional materials, and fabrication techniques. In addition, the centre will be used to demonstrate the application of existing plant and process methods to customers' materials, and to undertake work which does not justify the installation of pilot plant by the firms concerned. Training facilities will be available, and a student and graduate apprenticeship scheme has already been started in conjunction with a local technical college.

U.S. Machine Tool Exports

The following table gives the quantities of exports of various classes of machine tools from U.S.A. during July, 1957.

	Number	Value \$
Engine and tool room lathes	99	217,260
Light duty and bench lathes	201	62,202
Turret lathes	91	400,080
Other lathes	75	1,759,250
Vertical boring and turning mills ..	11	244,849
Boring machines	15	469,845
Tapping and threading machines ..	97	275,257
Milling machines	80	1,027,915
Gear cutting machines	68	1,140,905
Gear grinding and finishing machines	11	173,886
Drilling machines	388	1,094,017
Planing, shaping and slotting machines	52	573,615
Surface grinding machines	24	325,457
Tool and cutter grinding machines ..	118	192,699
Other grinding machines	38	957,363
Honing and lapping machines	20	117,246
Broaching machines	12	153,682
Sheet and plate metal-working machines	396	2,209,494
Forging machines and hammers ..	59	742,104
Metal forming machines	—	841,202
Other machines	503	888,441

Exhibition of Deckel Machine Tools

Burton, Griffiths & Co., Ltd., inform us that the exhibition of Deckel equipment which was held at the Mackadown Lane works of B.S.A. Tools, Ltd., from April 21 to 25 (see MACHINERY, 92/1040—2/5/58) has been transferred to their London showrooms, 93 Albert Embankment, London, S.E.11, and will remain open, concurrently with the Gauge and Tool Exhibition, until May 21.

The machines on view include the Deckel type LKB/S optical co-ordinate machine, the type F.P.1 and F.P.2 tool milling machines, the type K.F.1 pantograph die-sinking machine, and the type G.K.12 and G.K.21 pantograph milling machines. Demonstrations of the Sparcatron Mk. III spark erosion machining equipment are also being given.

Personal

VICE-ADMIRAL SIR FRANK MASON, K.C.B., has been appointed a director of H. W. Kearns & Co., Ltd., Broadheath, Manchester.

MR. F. O. ACKROYD, A.M.I.Mech.E., A.M.I.Prod.E., has recently been appointed a director of Crofts (Engineers), Ltd., Thornbury, Bradford.

MR. R. L. HOPKINS has recently been appointed technical representative in Scotland and the Newcastle-on-Tyne district for P.I. Castings (Altrincham) Ltd., makers of precision investment castings, Atlantic Street, Altrincham, Cheshire.

Correction

In MACHINERY, 92/1032—2/5/58, it was stated that Varatio variable-speed gear boxes, made by Varatio Strateline Gears, Ltd., are available with ratings from 1½ to 45 h.p. This should have read "½ to 45 h.p."

Scrap Metals

†LONDON.—†Prices per ton for non-ferrous scrap metals free from iron are as follows:—clean copper wire, untinned and free from lead and solder, £140; clean heavy copper, untinned and free from lead and solder, £135; second grade copper wire, £130; clean light copper £125; brazing copper, £112; gunmetal, £120; brass mixed, £85; lead, net, £59; zinc, £28; cast aluminium, £86; old rolled aluminium, £113; battery lead, £32; unsweated brass radiators, £69; hollow pewter, £495; black pewter, £365.

MIDLANDS.—The position from the standpoint of Midland merchants has shown no improvement during the past two weeks. A certain amount of scrap is moving to steelworks, blast furnaces and foundries but available supplies of all grades exceed demands. At the annual convention of the National Federation of Scrap Merchants it was announced that it was unlikely that there would be any substantial reduction in the maximum prices at present, but prices for some grades of scrap delivered to blast furnaces and foundries are now lower.

Clearance of "bushy" turnings, light iron, and light steel is difficult, as labels for direct delivery are scarce and merchants are only taking very limited quantities into their yards. The steelworks stocks are still very high, and consequently very few No. 2 heavy steel labels are available each week for loading.

Steel turnings of the chipped or shovellable types are moving steadily, and cast iron borings can be forwarded under allocation. Acceptances at foundries are limited and cast iron cannot be cleared regularly, but short heavy steel, to No. 2 specification, is being stocked in some instances in view of the possibility of a hold up in supplies due to the threatened rail strike.

Low nickel scrap is not wanted at special prices as works are only interested in material with 3 per cent nickel content or over.

Current maximum control prices, delivered consumers' works, are now: *Heavy steel No. 1, 217s. 6d.; *heavy steel No. 2, 196s.; *heavy steel No. 4, 207s. 6d.; *heavy steel No. 5, 195s. 6d.; light iron No. 8, 149s.; short turnings No. 9 (free from alloy), 167s. 3d.; light steel No. 11, 164s. 3d.; bushy turnings, 117s.; short alloy turnings, 160s. 9d.; short steel No. 2, 233s. 3d.; machinery cast, 233s.

Prices may be increased up to 2s. 6d. per ton according to quantities tendered over a given period.

* For use by Round Oak Steelworks, Brierley Hill, increase by 1s. 6d. per ton.
† George Cohen, Sons & Co., Ltd., Commercial Road, E.14.
‡ Subject to market fluctuations.

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* Firm

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16/5/58

Machine Tool Share Market

Although a rallying tendency developed towards the close, conditions in stock markets last week were unsettled, with the volume of business restricted, and price movements mainly to lower levels.

The London bus strike, coupled with fears of a railway strike, were the dominating influences which tended to cause dullness.

In the gilt-edged section there was some weakness, but absence of selling pressure had a steadying effect, and quotations for most stocks finished with moderate declines on balance.

Industrial share markets were subdued and displayed an easier trend for the most part. Nearly all sections were depressed, but near the finish the general tone strengthened, and closing prices were above the lowest.

Among machine tool issues, British Oxygen lost 1s. 6d., at 32s. 6d.; Brooke Tool, 3d. at 4s. 9d.; Clarkson (Engineers), 3d. at 12s. 3d.; Chas. Churchill, 1½d. at 4s. 4½d.; Churchill Machine Tool, 4½d. at 18s. 7½d.; John Shaw & Sons (Wolverhampton), 4½d. at 11s. 6d.; and Modern Engineering, 6d. at 9s. 6d. On the other hand, Noble & Lund advanced 9d. to 5s. 6d.

BROOKE TOOL MANUFACTURING CO., LTD.—Final dividend 5 per cent, making, with the interim, a total distribu-

tion of 7½ per cent for the year to September 27 last, as compared with a total of 5 per cent, for the preceding year.

F. PRATT & CO., LTD.—Interim dividend 12 per cent (same).

Booklet on Suggestion Schemes

The Committee of the Guildford and District Productivity Association, 14 Vicarage Gate, Onslow Village, Guildford, has recently been concentrating on popularizing suggestion schemes as a means of stimulating productivity in commercial and industrial businesses. In this connection a booklet of 13 pages (price 2s. 6d.) has been published under the title "Ideas at Work." It is stated that this booklet is the first on the subject that has been issued by any association affiliated to the British Productivity Council. Sections are included under the headings: a suggestions scheme is an essential function of management; the framework of a successful suggestion scheme; a yardstick to judge the success of a suggestion scheme; the Guildford Conference on suggestion schemes; a brains trust on suggestions schemes; case studies, statistics and stories; and "see for yourself."

The Association is to be congratulated on its enterprise, and the booklet should be of considerable assistance to firms who wish to introduce or improve such schemes.

COMPANY		Denom.	Middle Price	COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	9d.	Harper (John) & Co., Ltd.	Ord.	5/-	14/-
Armstrong, Stevens & Son, Ltd.	Ord.	5/-	7 10/11	"	4½% Red.	£1	13 1/11
Allen (Edgar) & Co., Ltd.	Ord.	£1	27 6	"	Cum Prf.		
"	5% Prf.	£1	15/-*	Herbert (Alfred), Ltd.	Ord.	£1	67 6
Arnott & Harrison, Ltd.	Ord.	4/-	13 9	Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	10 3
Asquith Machine Tools Corp., Ltd.	Ord.	5/-	18 1/11	"	"B" Ord.	5/-	9 9
"	6% Cum. Prf.	£1	18 6	Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	21 3
Birmingham Small Arms Co., Ltd.	Ord.	£1	28 6	"	7% Cum. Prf.	5/-	5/-
"	5% Cum.	£1	15 6xd	Kayser, Ellison & Co., Ltd.	Ord.	£1	45/-
"	"A" Prf.			"	6% Cum. Prf.	£1	18 3
"	6% Cum.	£1	17 9xd	Kendall & Gent, Ltd.	Ord.	5/-	7 9
"	"B" Prf.			Kerry's (Gt. Britain), Ltd.	Ord.	5/-	6 6
"	4% 1st Mort.	Stk.	85/-	Kitchen & Wade, Ltd.	Ord.	4/-	10 1
British Oxygen Co., Ltd.	Ord.	£1	32 6	Martin Bros. (Machinery), Ltd.	Ord.	2/-	2 4½
Brooke Tool Manufacturing Co., Ltd.	6½% Cum. Prf.	£1	21 6	Massey, B. & S., Ltd.	Ord.	5/-	7 9
Broom & Wade, Ltd.	Ord.	5/-	4 9	Modern Engineering Machine Tools Ltd.	Ord.	5/-	9 6
"	6% Cum. Prf.	£1	17 9	Newall Engineering Co., Ltd.	Ord.	2/-	4 6
Brown (David) Corporation Ltd.	5½% Cum. Prf.	£1	14 6	Newman Industries, Ltd.	Ord.	2/-	2 3
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	18 6	"	6% Prf. Ord.	5/-	5 6
Butler Machine Tool Co., Ltd.	Ord.	5/-	6/-	Noble & Lund, Ltd.	Ord.	2/-	5 6
"	5% Cum. Prf.	£1	13 9	Osborn (Samuel) & Co., Ltd.	Ord.	5/-	16 6
C.V.A. Jigs, Moulds & Tools, Ltd.	5½% Red.	£1	13 9	"			
"	Cum. Prf.			Pratt (F.) & Co., Ltd.	5½% Cum. Prf.	£1	25/-
Churchill (Charles) & Co., Ltd.	Ord.	2/-	4 4½	"	Ord.	5/-	21 3
"	6% Cum. Prf.	£1	25 7½	"	Ord.	4/-	5 3
Churchill Machine Tool Co., Ltd.	Ord.	5/-	18 7½xd	Scottish Machine Tool Corporation, Ltd.	Ord.	£1	33/-
"	6% Cum. Prf.	£1	18 6xd	Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	33/-
Clarkson (Engrs.), Ltd.	Ord.	5/-	12 3	Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	11 6
Cohen (George), Son & Co., Ltd.	Ord.	5/-	11 6	Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	35/-
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Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	13 3	Stedall & Co., Ltd.	Ord.	5/-	6 9
"	5% Cum.	£1	16 3	Tap & Die Corporation, Ltd.	Ord.	5/-	7 6
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Export Tool & Case Hardening Co., Ltd.	Ord.	2/-	1 3	"	5% Cum.	£1	24 9
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	12 6	"	2nd Prf.		
Greenwood & Batley, Ltd.	Ord.	£1	46 10/11	Wilson Lathes, Ltd.	Ord.	1/-	2 4½

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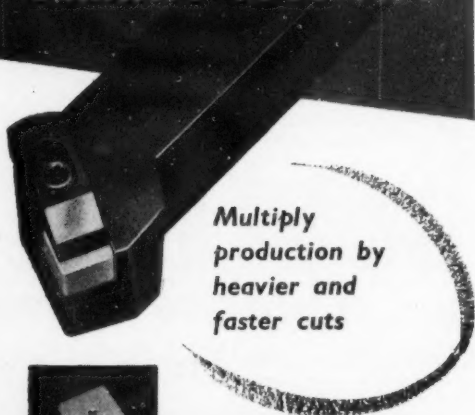
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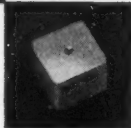
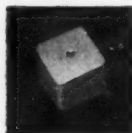
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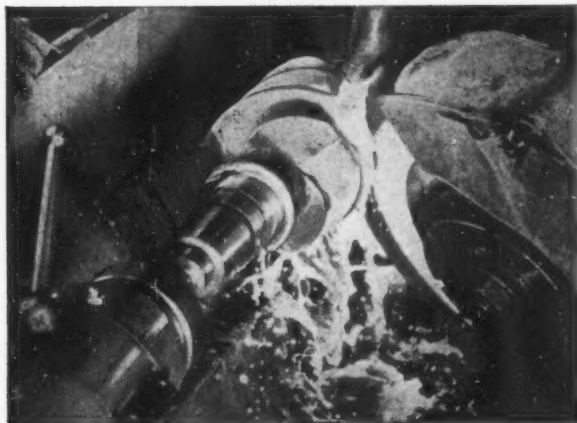
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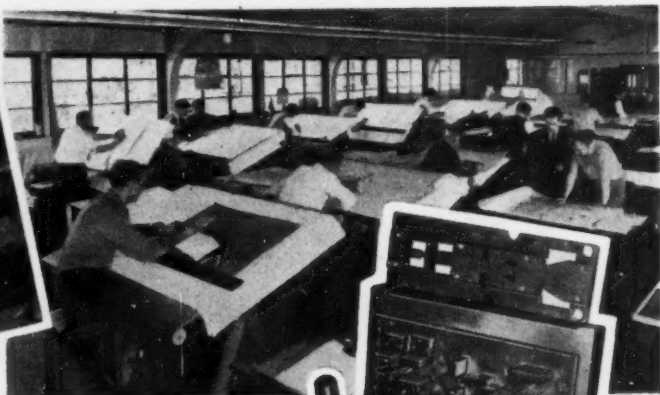
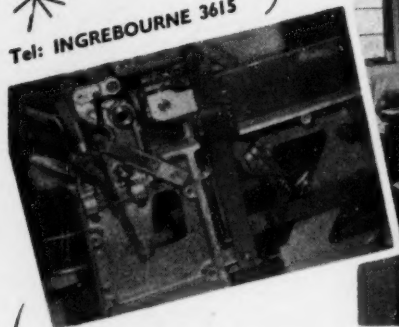
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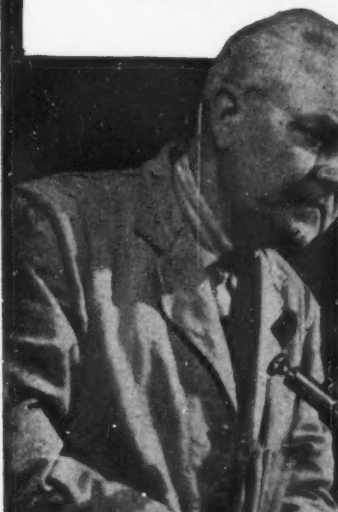
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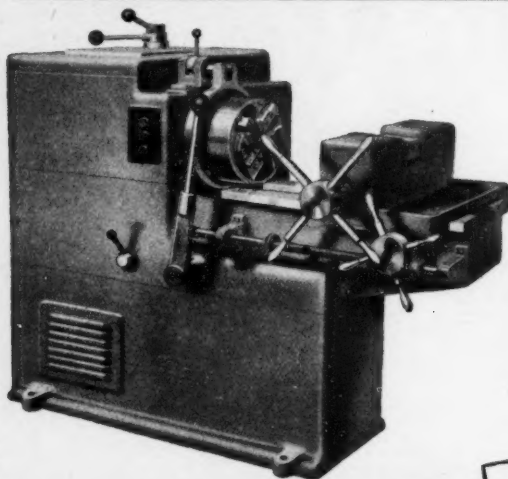
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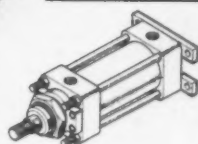
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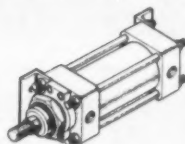
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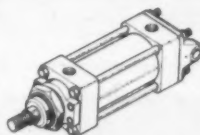
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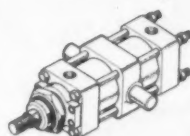
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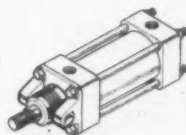
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C



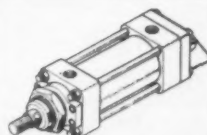
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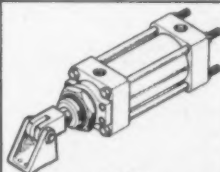
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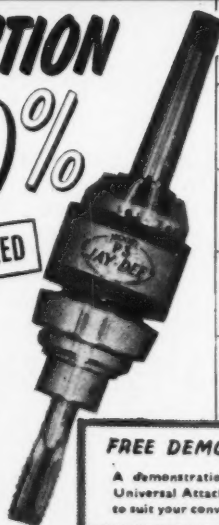
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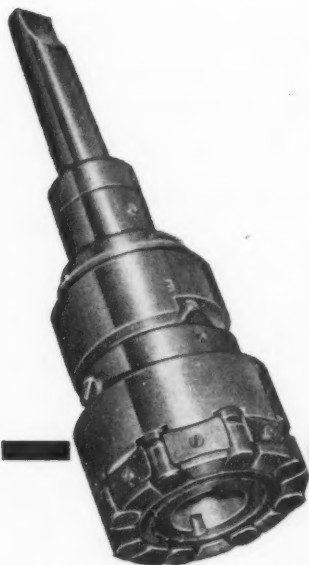
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A demonstration of the "JAY-DEE" Universal Attachment can be arranged to suit your convenience, at your works.

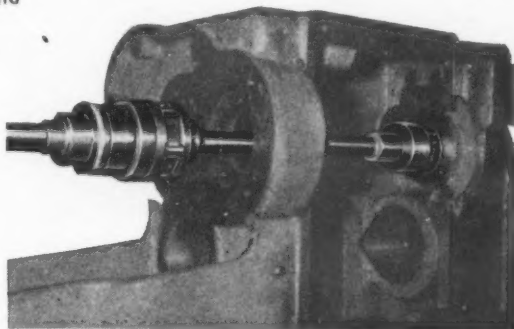
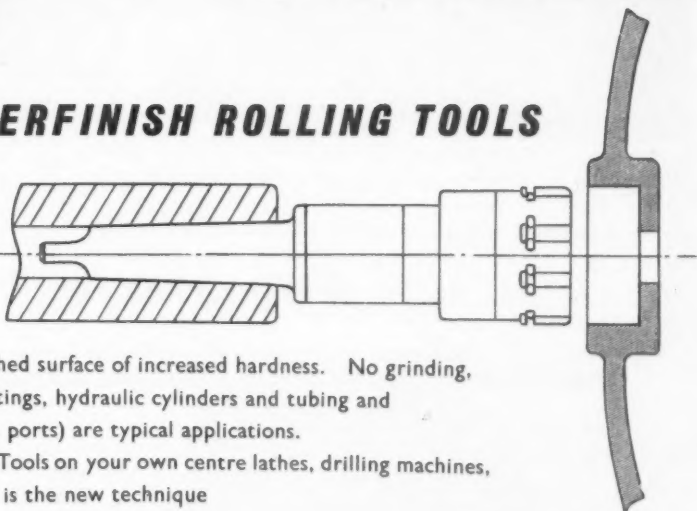


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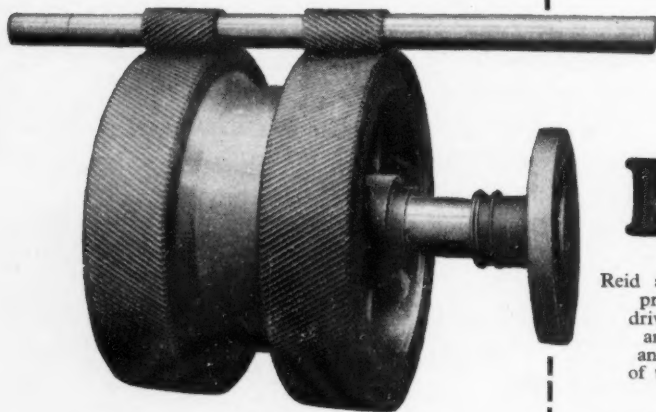
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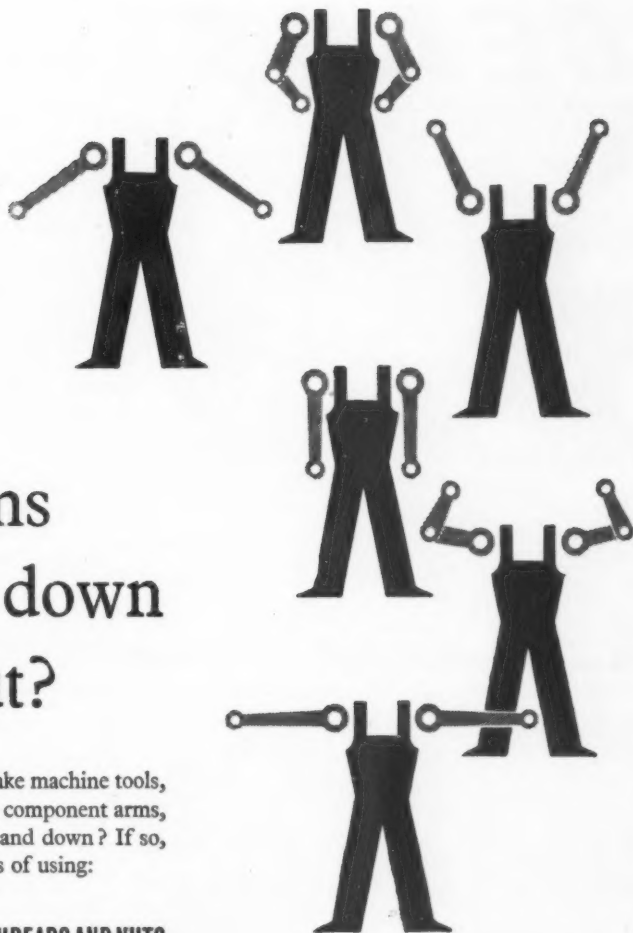


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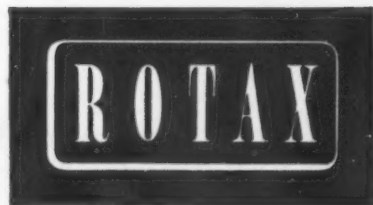
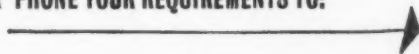
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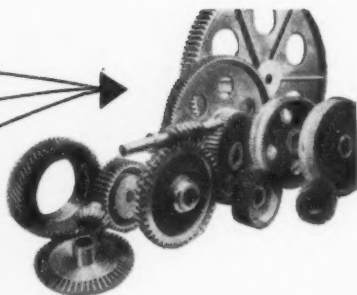


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Please send for a catalogue giving full details.

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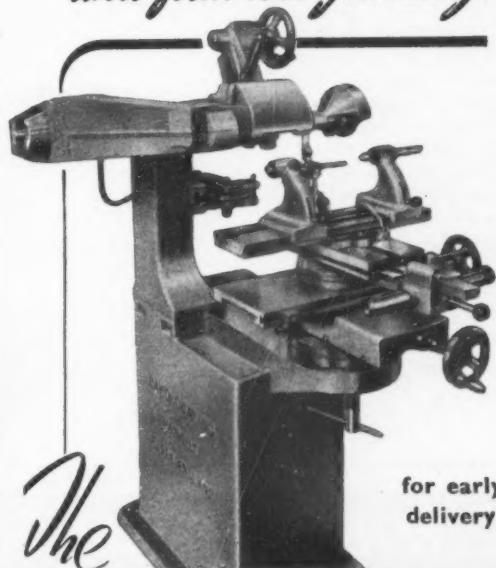
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the most flexible

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On this one machine, with its unique combination of horizontal, vertical and angular movements, all types of cutters can be sharpened at fast rates, including die-sinking, profile and form cutters. Operation is simplicity itself, the large, clear vernier graduation on all movements facilitating setting.

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Wheel head swivels	10° right by 15° left
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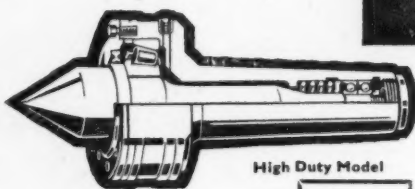
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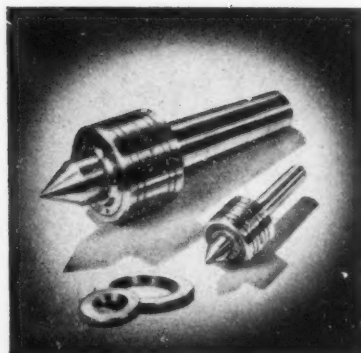
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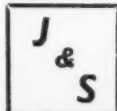
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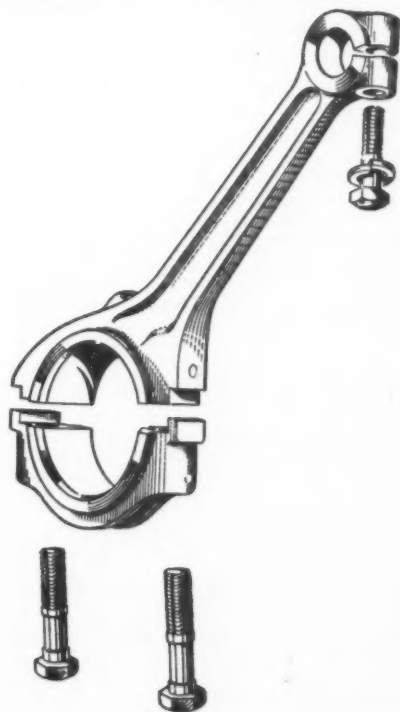
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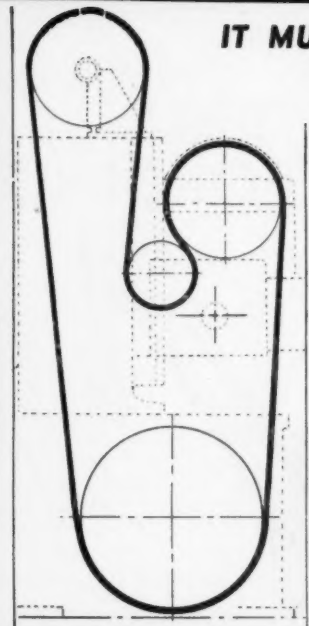
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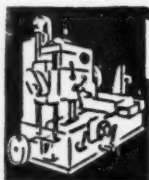
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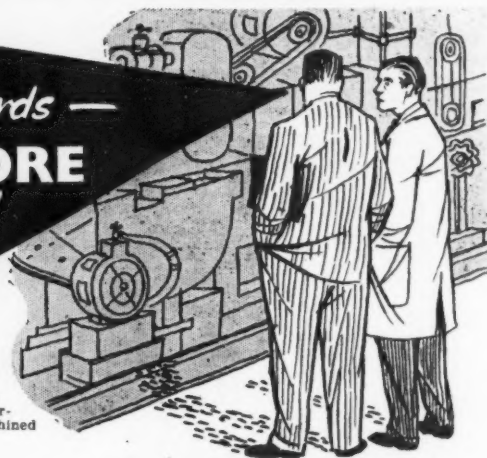
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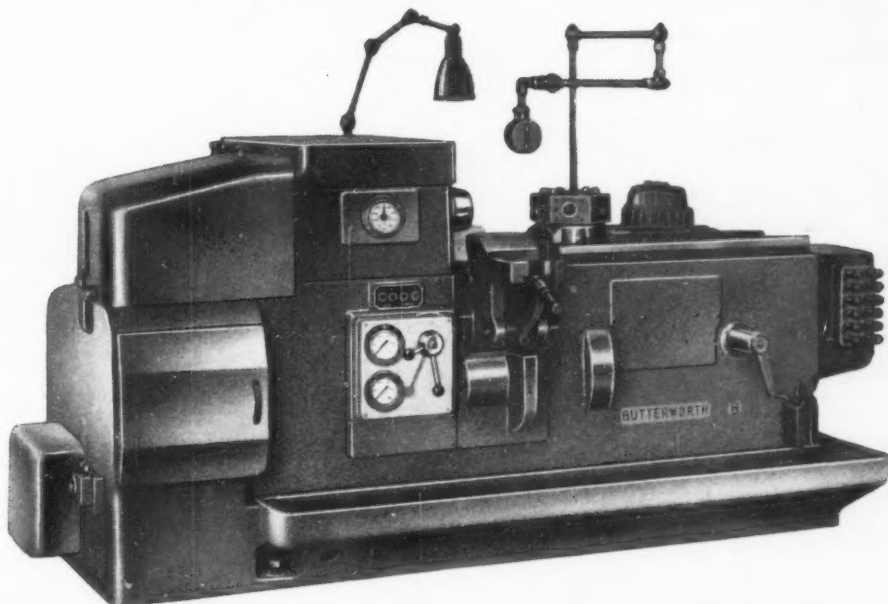
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The many outstanding features of this machine ensure faster cycle times and lower costs per piece. . . even on short runs. No special cams are needed and the exceptionally wide speed range covers all materials, from light alloys to high tensile steels. Hydraulic feed control. Hydraulic chucking. Hydraulic bar feed.

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BRITISH AUTOMATIC MACHINE TOOL CO., LTD.
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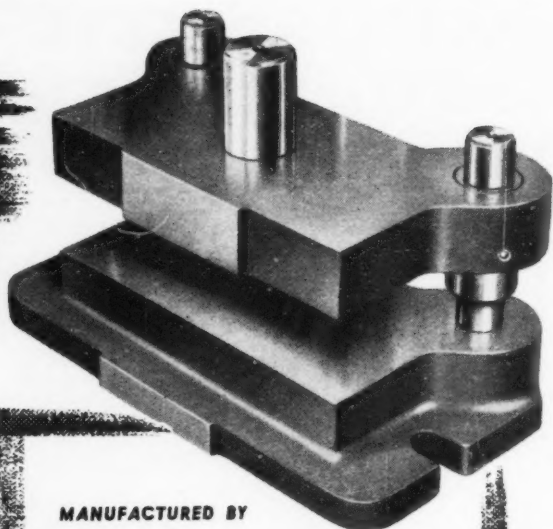
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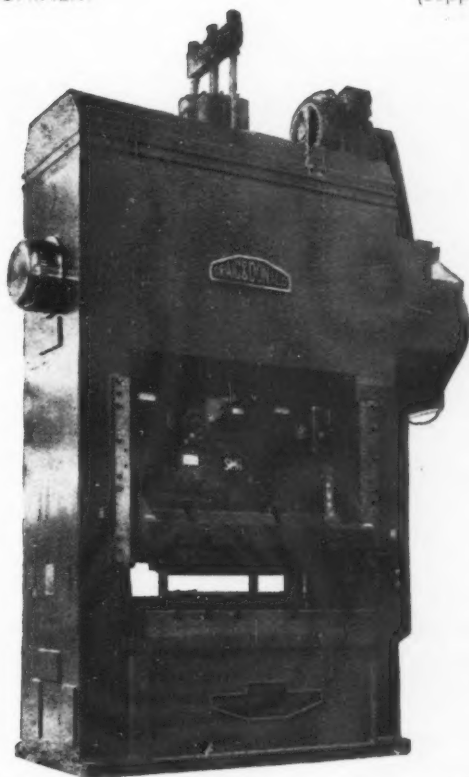
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The range, in both Brass and Steel, is from 0.5A to 5 BA and $\frac{1}{16}$ to $\frac{1}{2}$ inch diameter and between $\frac{1}{4}$ ' and 4' long. Recommended for use within this range, with rolled threads, where studding in these lengths in cut threads would be too expensive. Please send for stock lists.

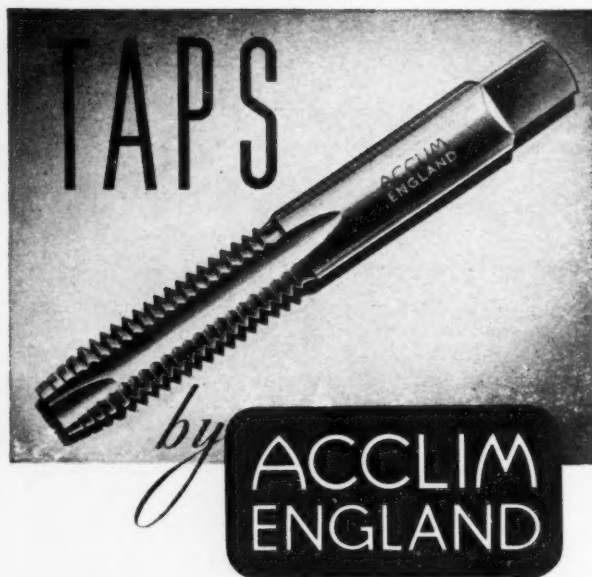
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HIGH SPEED STEEL
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Hydraulic SURFACE GRINDER

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Transverse	7.2"	7.2"
Vertical	12"	12"

With dust extractor or wet grinding equipment.

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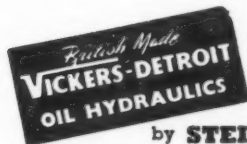
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Oil hydraulic cylinders made by S.A.V. Hydraulics are notable for their rugged construction and compact design.

The barrels are made from precision drawn tubing with honed mirror finish.

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These cylinders are made in 1" to 6" bore, stroke up to 6 ft., and are rated for maximum working pressures up to 2,000 p.s.i.

Adequate port sizes minimize pressure drop.

Adjustable cushioning can be provided at either or both ends of stroke.

These British made cylinders are available in a wide range of types for flange, foot, clevis, or trunnion mountings.

For descriptive literature on our oil Hydraulic products, please write for publication No. 117



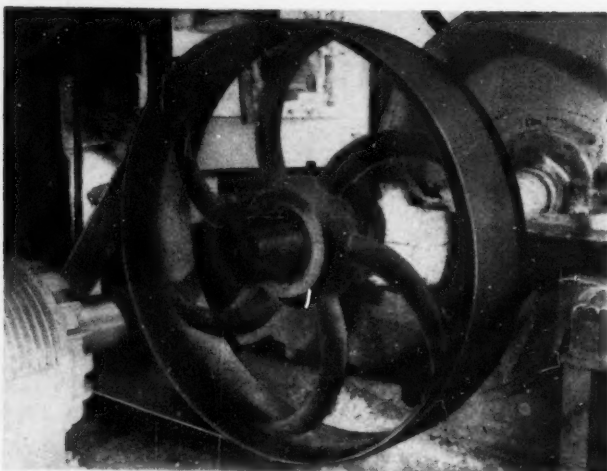
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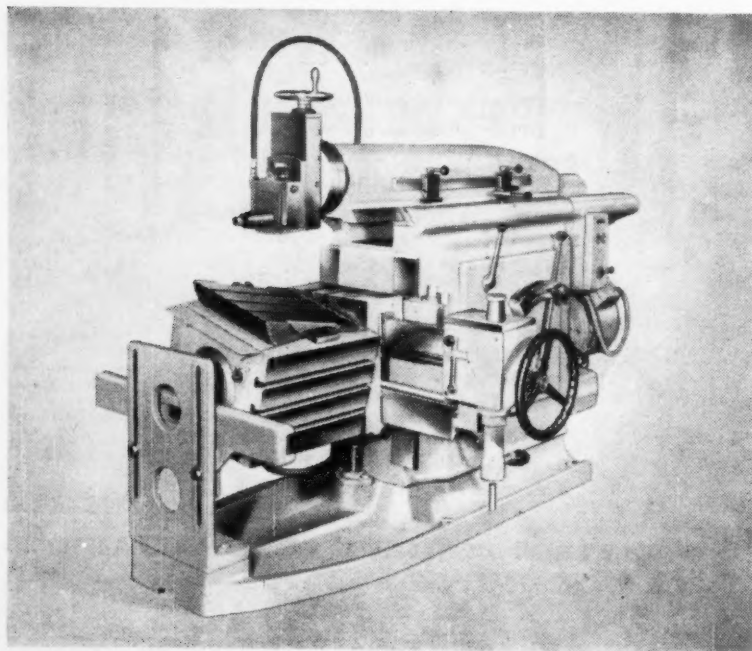
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S72



THE "HYDETSO" British HYDRAULIC SHAPERS

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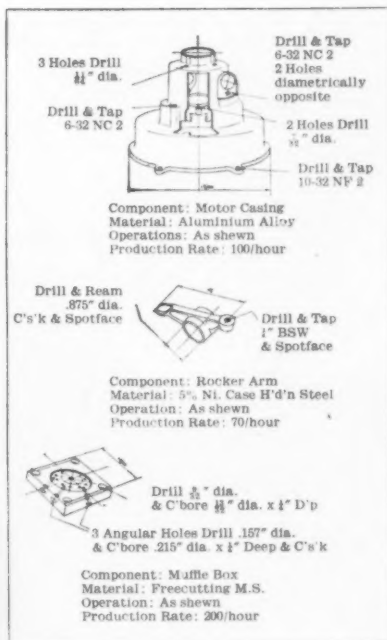
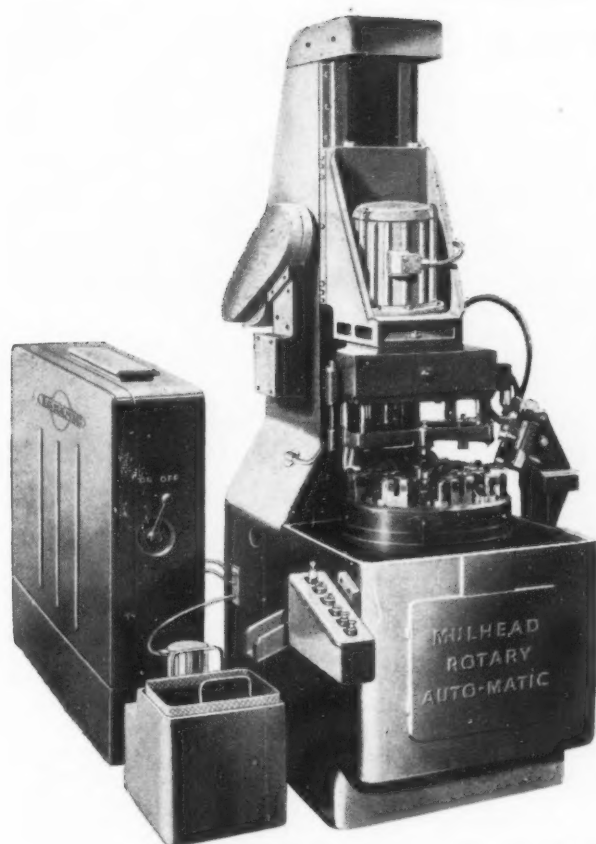
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SAFETY OVERLOAD
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Thomas Ryder & Son Ltd
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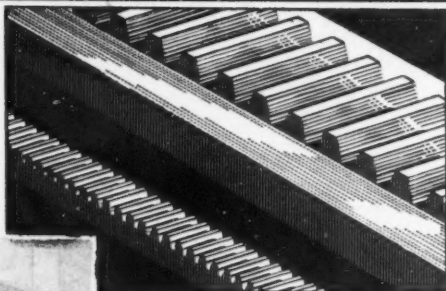
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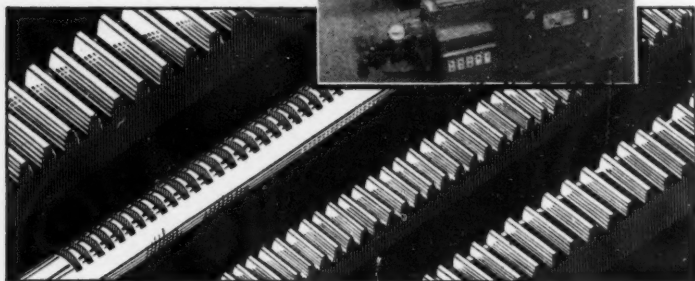
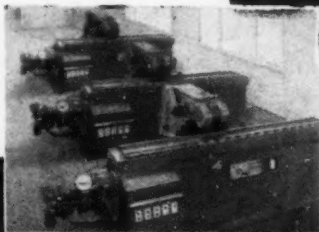
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D.Y.S. HYDRAULIC POWER

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PRESSURE
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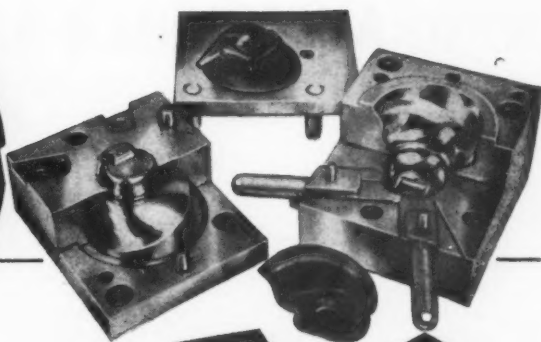
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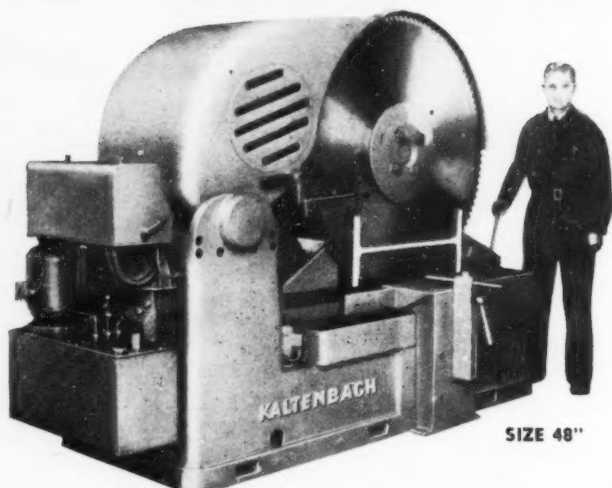
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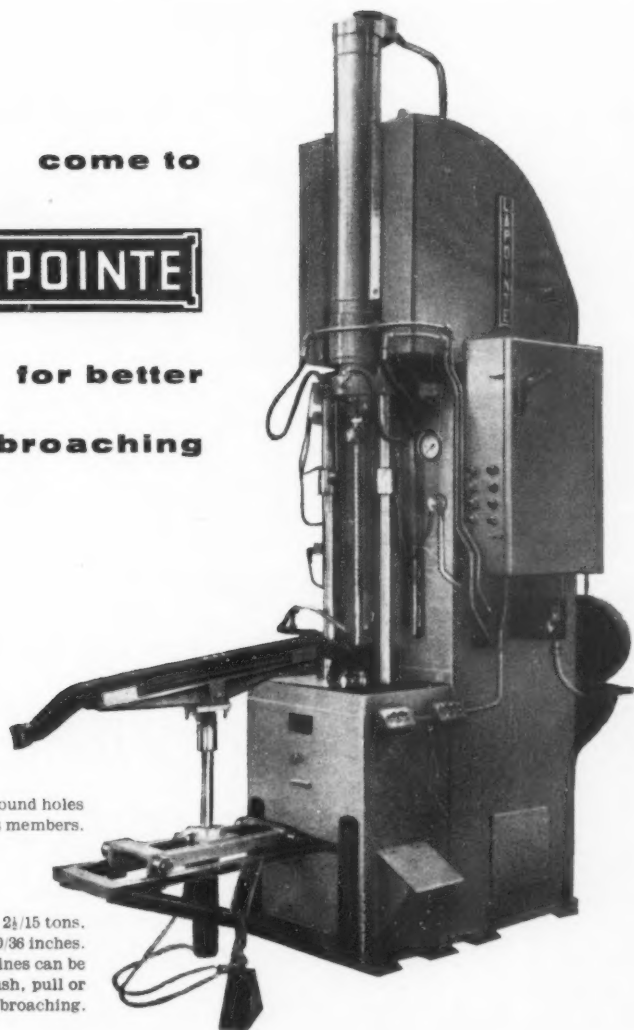
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Broaching round holes
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Capacity: 2½/15 tons.
stroke: 24/30/36 inches.
These machines can be
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It reduces packing time by at least 60 per cent. in Man Hours.

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Adequate protection for the coated article against all forms of corrosion, rust, etc.

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Protection against abrasion, mis-handling during transit.

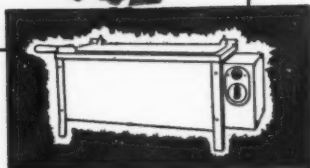
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Protection under all conditions. Particularly in hot, humid atmosphere or in extremes of cold.

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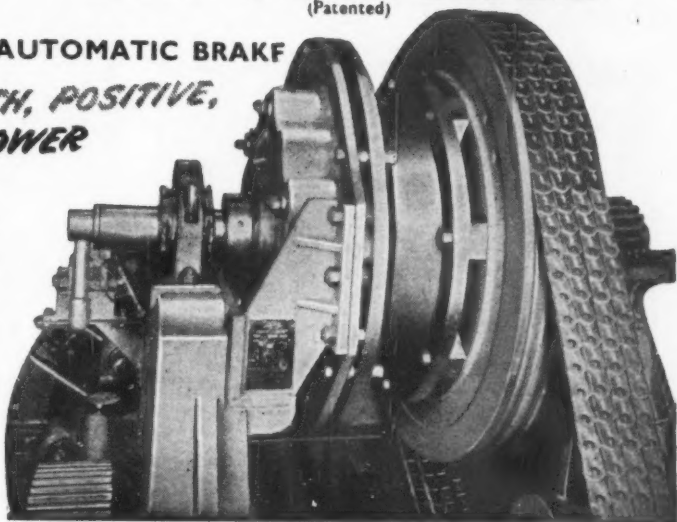
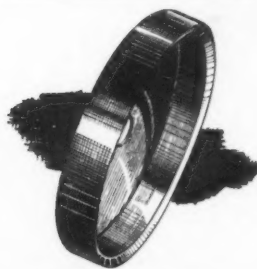
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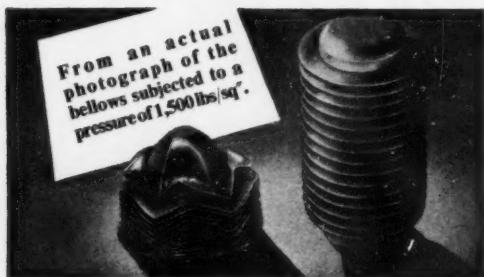
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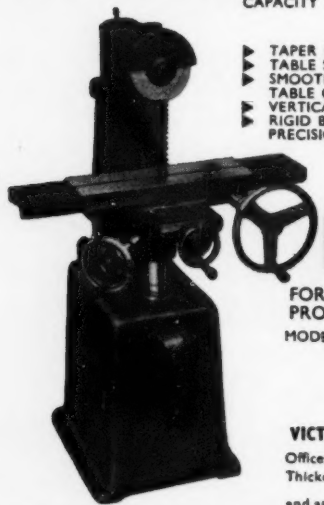


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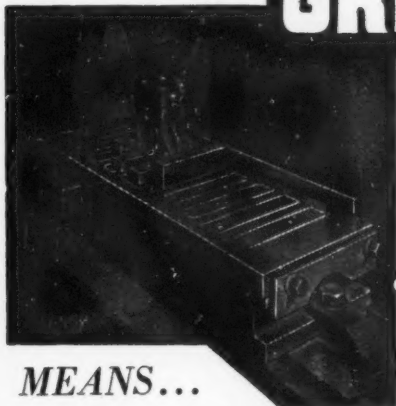
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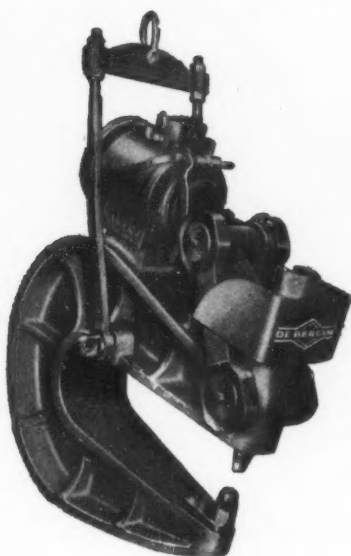
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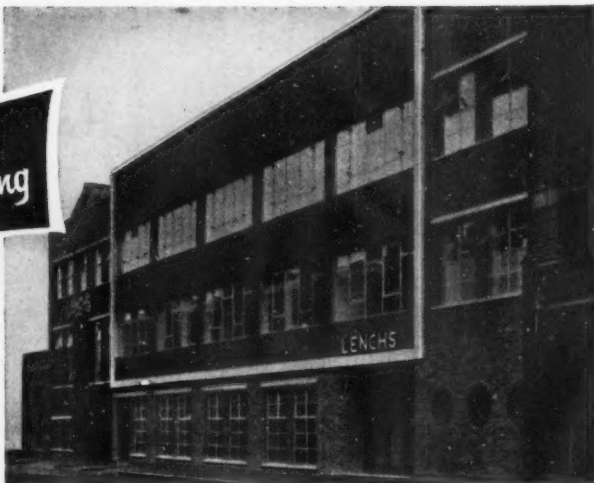
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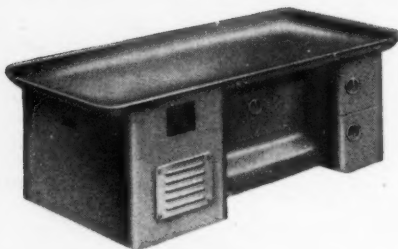
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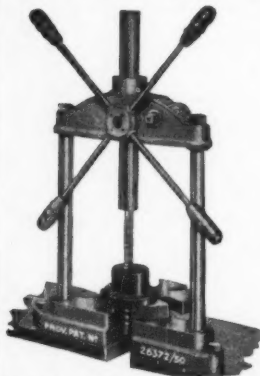
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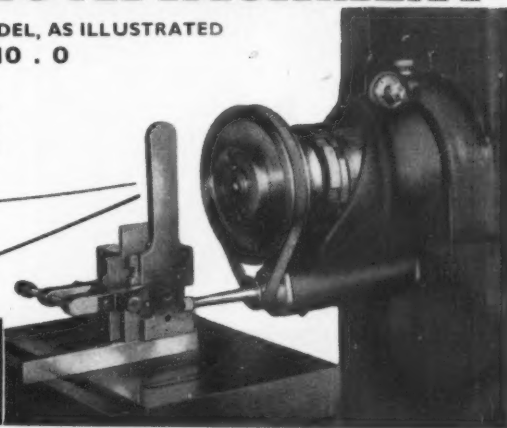
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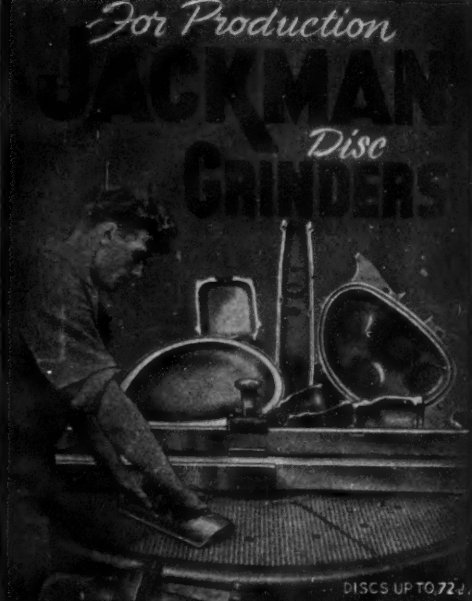
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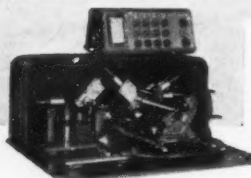
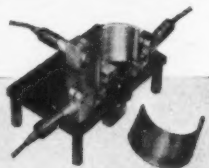
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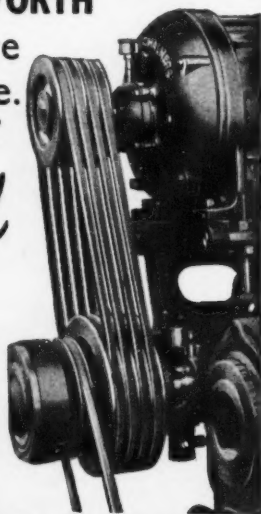


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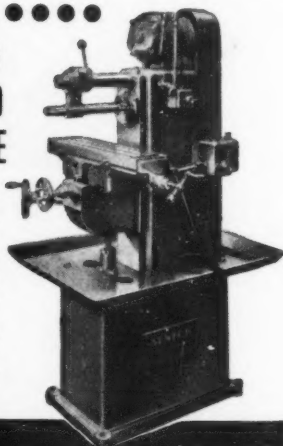
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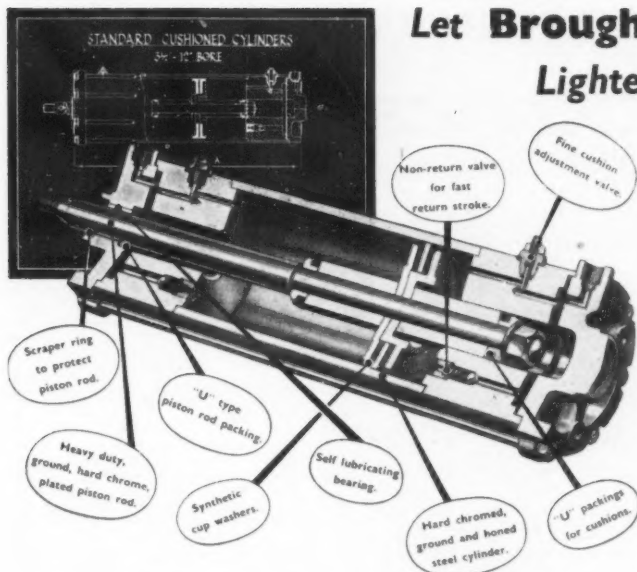


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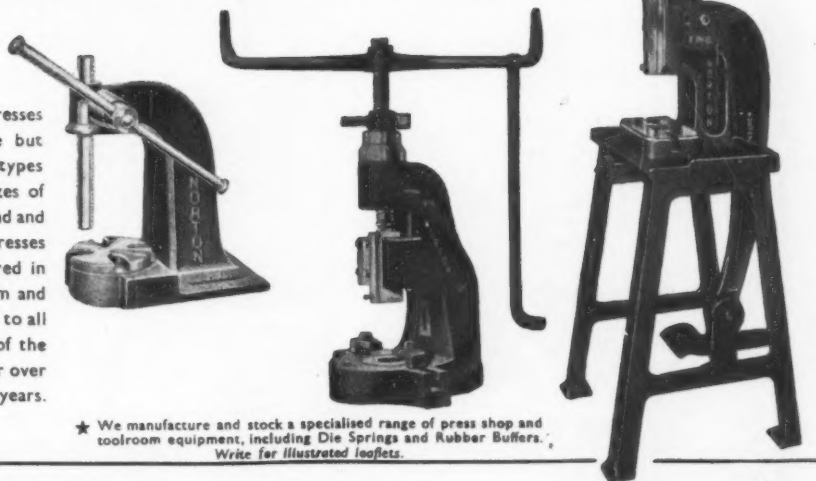
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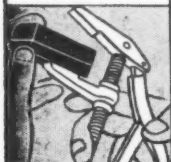
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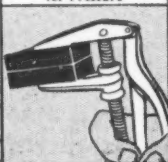


Lower Jaw Adjusted
to Correct Distance

Workpiece Removed,
Lower Jaw Adjusted
for Pressure



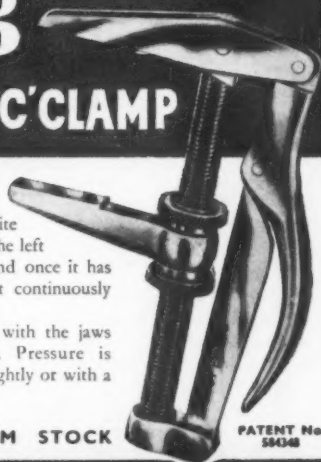
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to Insert Workpiece



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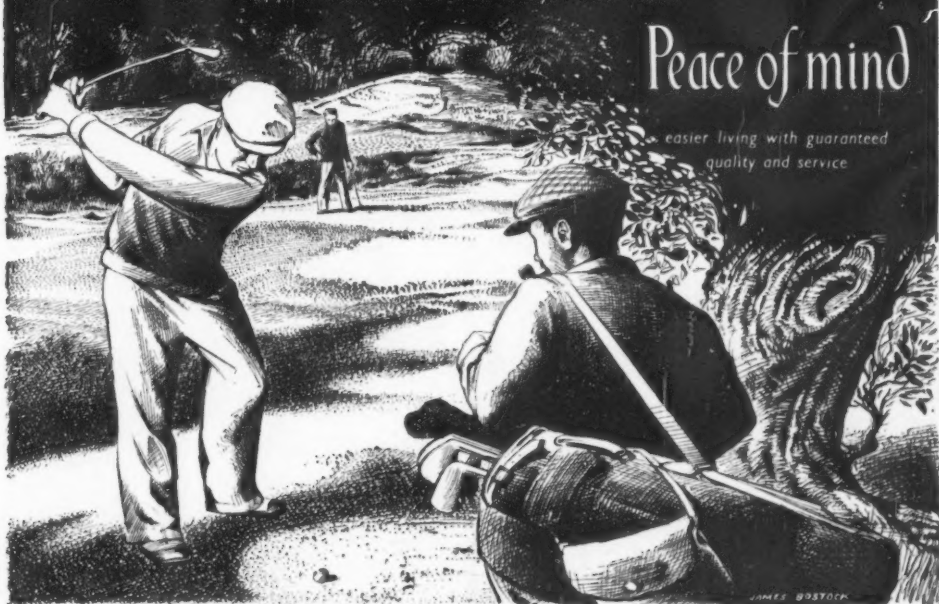
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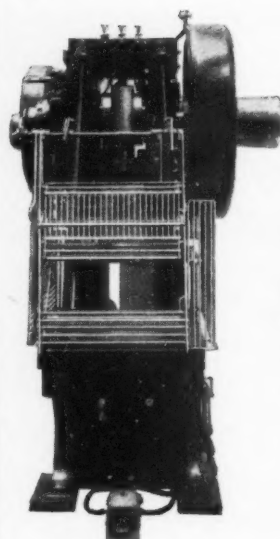
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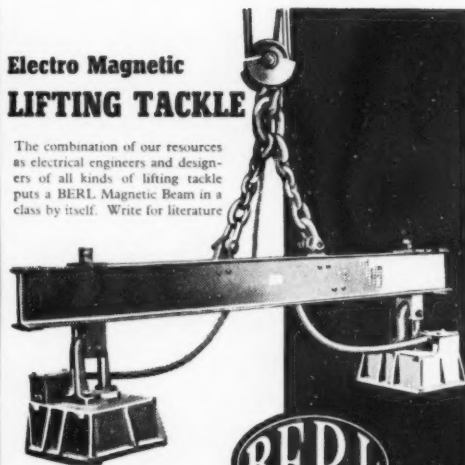
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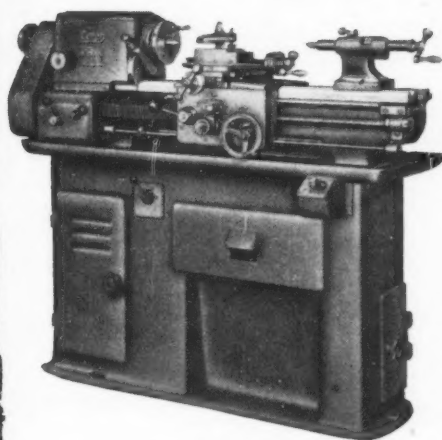
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Offered at
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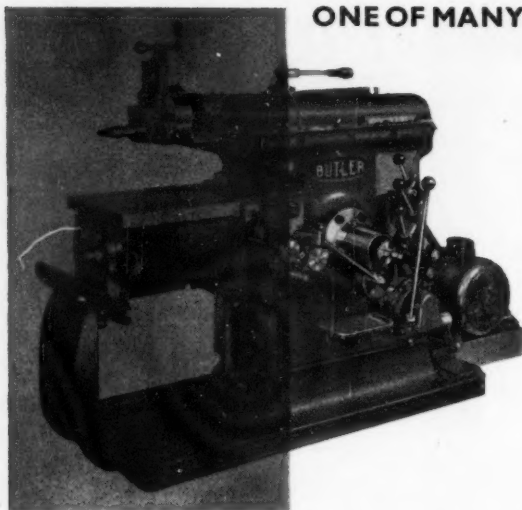
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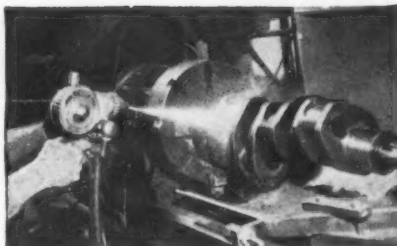
This bonding process is the subject of British Patent No. 692185

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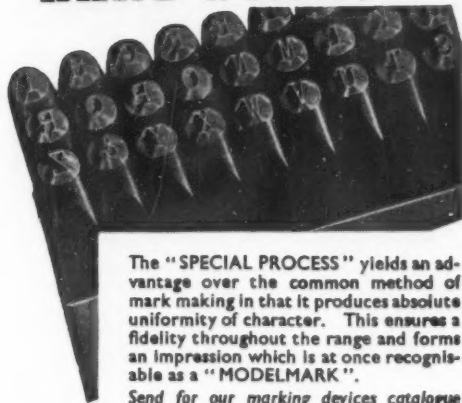
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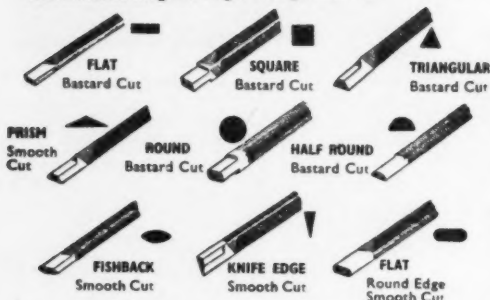
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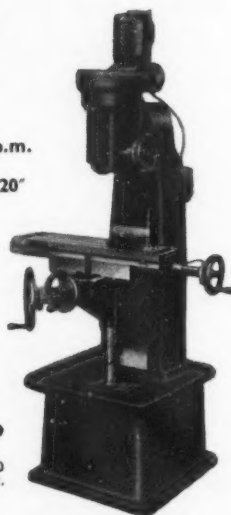
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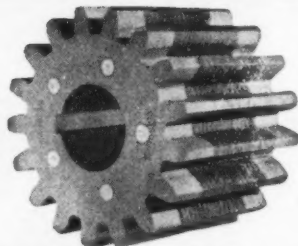
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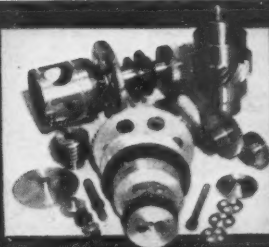
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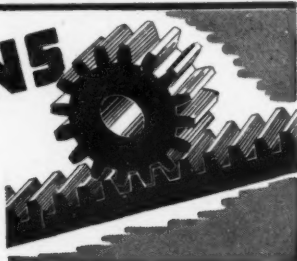
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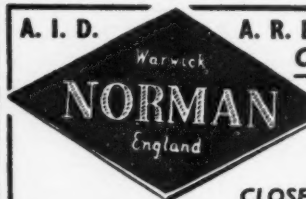
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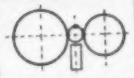
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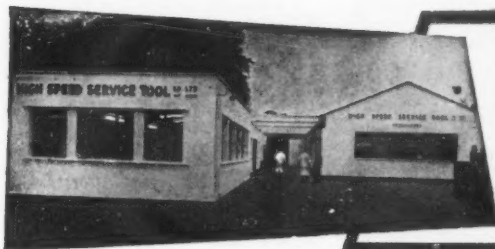


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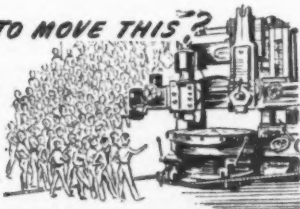
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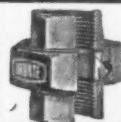
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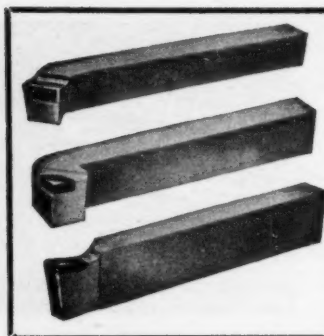
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No. 603083, for an invention entitled "Method
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on Magnetic Material." Particulars of the
proposed amendments were set forth in the
Official Journal (Patents), No. 2,612, dated
May 7th, 1958. Any person may give Notice
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Machine. Table 30in. by 10in. Speeds 96-1,500 r.p.m., complete with dividing head, toolholders, etc. As new.—BOX T103, MACHINERY, Clifton House, Euston Road, N.W.1

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Miller. A.G.H. Table 23in. by 12 1/2in. Motorised.—WILCOX & CO., Barr Street, Birmingham, 19. Northern 1234/5.

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Brocher. Slide 60in. by 12in. Table
14in. by 14in. Motorised.—WILCOX & CO.,
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Lathe. S/No. 1560. Speeds 68-400
r.p.m. with 4-jaw chuck and Suda Equip-
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HERBERT Auto Junior S/No. 28-617 1944.
With Airchuck and tooling. Electrics
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S/No. J.1452. Speeds 20-416 r.p.m.
Suda Equipment. Electrics 400-440/3/50.

FRITZ WERNER Horizontal Milling
Machine S/No. 43/28826. 40in. by 10in.
Table. Speeds 25-400 r.p.m. Feeds
0.12-0.360. Suda Equipment. Electrics
400/3/50.

ALDERMAN Horizontal Milling Machine,
40in. by 10in. Table speeds 38-600 r.p.m.
Feeds 4in.-7 1/2in. p.m. Suda Equip-
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45in. by 10in. Table. Speeds 14-350
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motorised 400-440/3/50.

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EASTERN AVENUE,
GLOUCESTER.

Corona 3-Spindle Drilling Ma-
chine. Type 13DX, independent motor,
mounted on each spindle, 4 speed pole change
460-2,945 r.p.m. No. 1 M.T. 30in. by 14in.
adjustable table. 400-440/3/50. £225.

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Craven 5ft., 6ft. and 7ft. Double
Upright Vertical Boring and Turning
Mills, with two saddles on the cross-slide.
Motorised for 400-440 volts, 3 phase, 50 cycles
A.C. Supply. NEW. Delivery immediate.—
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PBR

HORIZONTAL BORING AND FACING MACHINE

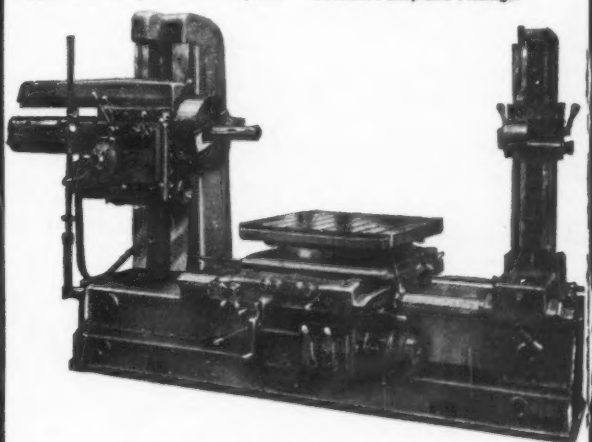
Spindle dia. ...	3 1/2in.
Range of speeds ...	35-1,200 r.p.m.
Traverse ...	24in.
Size of Table ...	39in. by 34in.
Rotates through ...	360 deg.
Max. distance spindle to table ...	35in.
Longitudinal traverse ...	51in.
Cross traverse ...	32in.
Max. distance facing head to outer support ...	88in.
Approximate weight ...	6 1/2 tons

PRICE £4,950

Approx. £600 returnable if Duty-Free
Licence is issued.

PRICE INCLUDES

Facing head, 17 1/2in. dia.
Horizontal Milling Attachment
with two Arbors 1 1/2in. and 1 1/4in. dia.
Universal Vertical Milling Attach-
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Open Scale Verniers.
Dial Indicators for Vertical and
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Coolant Pump and Fittings.



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Autos, motorised 440/3/50. Very good condition. Three available.—BOX V876, MACHINERY, Clifton House, Euston Road, N.W.1.

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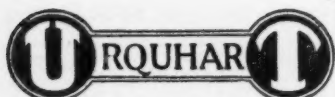


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ASQUITH Type E.G.C. 6 ft. Glider Type Radial Drill. Speed range 183-580 r.p.m.
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KEARNS Type OA Horizontal Boring Machine.
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 Modern Machines—Motorised 400-440/3/50. Fully Overhauled—Six Months Guarantee.

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Mot. No. 2 MT. heads mounted radially at 90 deg. Auto. feeds.—WILCOX & CO., Barr Street, Birmingham, 19. Northern 1234/5.

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by 7 ft. cap. D.C. Electric.—A. McNAMARA & CO., New Line, Bacup, Lancs. Phone: Bacup 946.

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SLOTING MACHINES**MUIR** 17in. Stroke Vertical Slotting Machine.**GRINDING MACHINES****SCRIVENER** No. 2 Centreless Grinding Machine.**LANDIS** Plain Hydraulic Cylindrical Grinding Machine, capacity 10in. by 96in.**LANDIS** Hydraulic Universal Grinding Machine, 14in. by 36in. between centres.**LANDIS** Type D Hydraulic Crank Pin Grinding Machine, capacity 21in. by 72in.**NEW EXCEL** No. 3 Hydraulic Surface Grinding Machine.**NEW EXCEL** No. 5 Tool and Cutter Grinder.**BROWN & SHARPE** No. 2 Surface Grinding Machine, capacity 6in. by 18in.**NORTON** Universal Grinding Machine, type "C", capacity 12in. by 36in.**LANDIS** Type "C" Plain Hydraulic Cylindrical Grinding Machine, capacity 10in. by 36in.**CHURCHILL** Universal Grinding Machine, 10in. by 24in. between centres.**NORTON** 6in. by 18in. Plain Cylindrical Grinding Machine.**B.S.A.-LANDIS** Type "C" Plain Hydraulic Cylindrical Grinding Machines, 6in. by 30in. (Two available.)**CHURCHILL** Model HBY Internal Grinding Machine.**BORING MACHINES****UNION** Horizontal Boring Machine, Model BFT. 100 34in. dia. travelling spindle, 24in. dia. facing head (1957).**RICHARDS** Type PRT Horizontal Type Floor Boring Machine, 34in. dia. travelling spindle and 28in. dia. facing head.**ASQUITH** 7in. Horizontal Floor Boring Machine.**PENSOTTI** 48in. Vertical Boring Machine (1954).**BERTHIEZ** Model 9340 Vertical Boring Mill table diameter 7ft. 10in., maximum turning capacity 9ft. 6in. (1953.)**JUNGENTHAL** Model KE.1200 Vertical Boring Mill, table diameter 39in., maximum turning capacity 50in. (1954.)**FRORIEP** Vertical Boring Mill, table diameter 39in., maximum turning capacity 52in. (1955.)**KEARNS** No. 3 Horizontal Boring Machine, 34in. diameter travelling spindle, maximum facing diameter 24in.**KEARNS** No. 5 Horizontal Boring Machine, 5in. diameter travelling spindle, maximum facing diameter 48in.**RICHARDS** Double Column 6ft. Vertical Boring Mill, maximum turning capacity 72in.**NILES** Model W7 Horizontal Boring Machine, table size 3ft. 4in. by 2ft. 7in., spindle 24in. dia., facing head 20in. diameter.**MILLING MACHINES****MILWAUKEE** No. 2H Vertical Milling Machine, table 50in. by 10in.**REED PRENTICE** No. 6 Vertical Milling Machine, table 84in. by 20in.**SUNDSTRAND** Hydro-Screw Rigidmill Automatic Production Milling Machine, table 7in. by 14in., table traverse 48in.**CINCINNATI** 1/12 Horizontal Production

Milling Machine.

RICHMOND Model 03SD Universal Milling Machine with Dividing Head, Vertical Attachment, etc.**CENTEC** Model 3R Automatic Production Milling Machine, table 8in. by 30in.**CINCINNATI** 2M Universal Milling Machine.**MILWAUKEE** No. 4H Plain Horizontal Milling Machine, table 74in. by 154in.**CINCINNATI** No. 3 Dial Type Plain Horizontal Milling Machine, table 624in. by 15in.**VICTOMATIC** Automatic Cycle Production Milling Machine, capacity 50in. by 10in.**REED-PRENTICE** No. 5 Vertical Milling Machine, table 68in. by 16in.**GEAR MACHINES****MUIR** 72in. spur and helical Gear Generating Machine.**ORCUTT** 24in. Gear Grinding Machine.**KOLB** Gear Grinding Machines.**SYKES** V.10 Gear Generator.**GLEASON** 3in. Bevel Gear Generators. (Two available.)**GLEASON** No. 9 Bevel Gear Compressor Machine.**DRILLING MACHINES****KITCHEN & WADE** 28V10 Single Spindle Vertical Drilling Machine, No. 4 M.T.**ARCHDALE** Multi-spindle Drill Machine, 36 spindles.**HETTNER** Radial Drilling Machine, having 10ft. Radial Arm elevating column type.**TOWN** 30in. Vertical Spindle Boring, Drilling and Tapping Machine, No. 5 M.T.**KITCHEN & WADE** 4ft. 6in. Radial Drilling Machine.**KITCHEN & WADE** 4ft. Radial Drilling Machine.**ASQUITH** ODI 6ft. Radial Drilling Machine.**CAPSTAN & CENTRE LATHES****WARD** 7B Hexagon Turret Lathes with bar feed. (Two available.)**OLDFIELD & SCHOFIELD** Boring and Surfacing Lathe, cross-traversing Turret type.**LE BLOND** Regal Centre Lathe, 94in. by 42in. between centres.**BRADFORD** 84in. centre height by 30in. between centres Centre Lathe.**HERBERT** No. 8 Combination Turret Lathe.**URQUHART LINDSAY & ROBERTSON** ORCHAR Centre Lathe, 16in. by 30ft. 6in. between centres.**LIBBY** Model 2H-8 Combination Turret Lathe, 84in. hollow spindle.**HERBERT** No. 12 Combination Turret Lathe with comprehensive tooling.**NILES** Centre Lathes 134in. centre height by 27ft. between centres. (Two available.)**NILES** Centre Lathes, 15in. centre height by 28ft. between centres. (Two available.)**BETTS-BRIDGEFORD** Centre Lathe, 15in. centre height by 16ft. between centres. (Two available.)**WARD** No. 7 Combination Turret Lathe.**AUTOMATICS****ACME GRIDLEY** Model RA6 24in. spindle Bar Automatic.**PONGRACZ** Single Spindle Automatic capacity 10 mm.**CONOMATICS** 34in. 4-spindle Bar Automatics. (Three available.)**PLANING MACHINE****URQUHART LINDSAY & ROBERTSON** ORCHAR Spiral Drive Heavy Duty Planing Machine, capacity 16ft. by 5ft. by 5ft.

Topical Touch

Daddy's gone on strike

* But he said to remind you that Machine Tools by Newman never stop working

All the machines on this page are motorised for 400-440 volts, 3-phase, 50 cycles. For further details of any item listed or for a copy of our complete Stocklist write or 'phone

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Telegrams: "Dynamo Yate"

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Birmingham (Midland 1143).

Manchester (Deansgate 2837/8).

Glasgow (Central 2101/2).

□

SELECTIONS FROM OUR LARGE STOCK OF MODERN MACHINE TOOLS

(All machines motorised 400-440/3/50 and overhauled unless otherwise stated)

LATHES, CAPSTANS AND AUTOS.

WARD 10 Combination Turret Lathe.
HERBERT No. 8 Combination Turret Lathe, covered bed.

SMALLPIECE No. 6 M.S.L. Multi-Production Lathe.

HERBERT 5A Capstan chucking m/c.
HERBERT Model O Capstan, pneumatic bar chuck and bar feed.

ACME 5W Turret Lathe, chuck machine.

WARD 3A Capstans, B/C and B/F. 2 M/cs.

WARD 2A Capstans, B/C and B/F. 2 M/cs.

D.S.G. 18Z MINOR 64in. by 31in. S.S. & S.C. Lathe.

HOLBROOK MOD. T. No. 13 Precision Toolroom Lathe.

DRILLS.

KITCHEN & WADE 32in. Radial 3 M.T. Sens.

ARCHDALE Mod. 2220 Pillar, 11in. cap., p/feeds.

HERBERT Type "C" Pillar, 14in. cap., p/feeds.

JONES & SHIPMAN Fig. 921, 30in. Pillar, 2in. cap., p/feeds.

GRINDERS.

CINCINNATI No. 2 Tool and Cutter.

CHURCHILL Mod. H.A.Y. Internal Hyd.

NEWALL 10in. by 36in. Plain Hyd.

ABRASIVE Mod. 3B Surface, cap. 8in. by 24in.

CHURCHILL Mod. N.B. Horizontal Surface, cap. 6in. by 18in.

SNOW Mod. OS72 Hor. Spindle Surface, hyd. cap. 72in. by 18in.

PALLAS No. 0 Surface, cap. 14in. by 51in.

NEWALL Mod. L.U. 12in. by 36in. Hyd. Universal.

B.S.A. LANDIS Type "C" 6in. by 18in. Hyd. Plain.

CHURCHILL Mod. B.Y. Hyd. Angle Head Automatic, plain.

ABWOOD Vert. Spindle, Surface, cap. 18in. by 6in. (AS NEW.)

CHURCHILL Mod. H.C.B. Hyd. Auto Sizing. Internal.

MILLERS.

MILWAUKEE Mod. 2HL. Plain.

KENT-OWEN No. 1/14 Hyd. Plain. 2 m/cs.

VAN NORMAN No. 2L. Plain, table 45in. by 10in.

CINCINNATI Mod. 08 Vert., table 24in. by 6in.

HERBERT No. 1 Plain, with auto. feed.

ARCHDALE 20in. Plain, with rapid traverse.

CINCINNATI 18in. Manig. Model O.K., table 34in. by 12in.

ARCHDALE 14in. Plain, table 27in. by 8in., long. travel 14in.

ASQUITH Type V Vert., table 50in. by 14in., long. travel 28in.

MISCELLANEOUS.

MOTCH & MERRYWEATHER No. 3 Cold Saw.

NOBLE & LUND 11in.-16in. Cold Saw.

T.M.A. Mod. G2 Pantograph Engraving Machine.

CLEVELAND Rigidhobbers, 2 machines mod. 120, 1 machine mod. 130



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Herbert 18P Plain Milling Machine. Table 57in. by 13in. M/D 400/3/50.—ALBERT EDWARDS (MACHINE TOOLS) LTD., 79/89, Pentonville Road, London, N.1. Phone: TERMINUS 0167/8/9.

No. 2C Ward Motorised Bar Feed Capstan Lathe. Lever chuck, 11in. gap. Swing over bed 131in., 12 spindle speeds 48-2,041 r.p.m., 1950 machine. Excellent condition.—LEE & HUNT, LTD., Crocus Street, Nottingham.

Two Stevens & Bullivant No. 4 Rotary Cold Swaging Machines for sale. For rod or tube pointing. Capacity mild steel: solid 4in., tube 4in. Electric equipment 400-440/3/50.—Illustration and full details from F. J. EDWARDS, LIMITED, 359, Euston Road, London, N.W.1.

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Universal Diamond Wheel Tool Grinder for Chipbreaker Grinding, etc.—WILCOX LTD., Barr Street, Birmingham, 10, Northern 1234/5.

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Table 16 1/2 in. by 11in. .. £454

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Open Side Surface Grinder, w/s of table 120in. by 15in., complete with two 5ft. 0in. by 15in. Humphrey Magnete Chucks, extra hand feed to wheelhead, in excellent condition.—BOX V902, MACHINERY, Clifton House, Euston Road, N.W.1.

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spindle Chucking Automatic, 1943, in excellent condition, £1,500, equipment extra.—BOX V823, MACHINERY, Clifton House, Euston Road, N.W.1.

Thread Milling Machine by

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RICHARDS 48in. Double Upright Vertical Boring and Turning Mill, two swivelling toolboxes on cross slide.

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HERBERT 48S Bar Capstan Lathe, fitted turret toolholders, pump, bar feed, speeds 30 to 511 r.p.m.

HERBERT No. 20 Combination Turret Lathe, 7½in. diameter spindle, 28in. swing over bed, 97in. distance spindle to turret. Speeds 5 to 201 r.p.m.

CENTRE LATHES

LE BLOND Heavy Duty 33in. swing by 28ft. between centres, S.S. & S.C. Lathe, late type, all geared headstock, twin saddles, taper turning, 32in. diameter, four-jaw chuck, 25 h.p. A.C., 3-phase electric, speeds 4 to 255 r.p.m.

BROADBENT 14in. S.S. & S.C. Gap Bed Lathe, admits 90in. swings in gap 50in. speeds 5 to 204 r.p.m. Well equipped Nearly New.

BINNS & BERRY 12½in. S.S. & S.C. Gap Bed Lathe, admits 7ft. 6in. between centres, speeds 12 to 600 r.p.m. NEW.

COLCHESTER TRIUMPH 7½in. by 48in. All-gear Head Gap Bed Lathe, speeds 40 to 800 r.p.m. NEW.

DEAN SMITH & GRACE Model "AN" 7½in. by 48in. S.S. & S.C. Straight Bed Lathe, speeds 11 to 490 r.p.m. Serial No. 20300.

WILLSON Mark V 7½in. by 48in. S.S. & S.C. Gap Bed Lathe, admits 48in., speeds 54 to 954 r.p.m. and 37 to 739 r.p.m. NEW.

DEAN SMITH & GRACE Type "A" 7in. by 31in. S.S. & S.C. Gap Bed Centre Lathe, speeds 11 to 490 r.p.m. Serial No. 21303.

REIDEN 7½in. by 40in. S.S. & S.C. Gap Bed Toolroom Lathe, fitted taper turning attachment, pump, 3-jaw chuck, speeds 25 to 1,350 r.p.m. NEW.

MITCHELL 6½in. by 64in. S.S. & S.C. Gap Bed Centre Lathe, taper turning attachment, speeds 27 to 400 r.p.m. Nearly New.

MYFORD Super Seven Lathe, 3½in. by 19in., speeds 25 to 2,150 r.p.m. NEW.

DRILLING MACHINES

RICHMOND S.R.2 36in. Radial Drill, elevating table, suds pump. NEW.

JONES & SHIPMAN 30in. Model 921. 2-spindle Manufacturing Drilling Machine. 1½in. capacity, speeds 39 to 825 r.p.m. Table 42in. by 24in.

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Horizontal Borer, 3½in. diameter traversing spindle, fitted facing head, maximum distance facing head and outer steady 88½in. Table 35½in. by 44½in. Used three months only. Nearly new condition. £1,000 below to-day's cost price.

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LANDIS Hydraulic Universal Grinder, type "C", capacity 10in. by 24in. Serial No. 27916.

MYFORD M.G.12 Plain Cylindrical Grinder capacity 5in. by 12in. NEW.

NEWALL Model 420 Thread Grinder. Well equipped. Built 1943.

All machines motorised 400-440 volts, 3 phase, 50 cycles, A.C. supply.
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CINCINNATI No. 4 Dial Type Vertical Milling Machine, table 78½in. by 16½in., rapid and power traverses 42in. by 16in. by 16in. Speeds 18 to 1,300 r.p.m. British built 1941.

ASQUITH two-spindle Vertical Milling and Profiling Machine, type LDP, speeds 250 to 3,000 r.p.m. Nearly New.

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CINCINNATI No. 4 Dial type Universal Milling Machine, table 78½in. by 16½in., rapid and power traverses 42in. by 14in. by 19in. Speeds 18 to 1,300 r.p.m. With Universal Vertical Attachment. British built 1947.

REIDEN H.F.30 Universal Milling Machine table 59in. by 14½in., rapid and power traverses 39½in. by 11½in. by 15½in., speeds 44 to 1,457 r.p.m. NEW.

VICTORIA U.2 Universal Milling Machine, table 45in. by 11in., power feeds 29½in. by 65in. by 16in. speeds 30 to 1,010 r.p.m. NEW.

RICHMOND No. 3 Universal Milling Machine, table 48in. by 11in., rapid and power traverses 30in. by 8in. by 16in., speeds 20 to 1,000 r.p.m. NEW.

DENBIGH C.4 Universal Milling Machine, table 46in. by 10in., automatic longitudinal feed 36½in., speeds 13 to 400 r.p.m. NEW.

Horizontal

ARCHDALE 20in. Plain Horizontal Milling Machines, table 40in. by 10in., traverses 20in. by 5½in. by 12in., speeds 30 to 615 r.p.m.

CINCINNATI 1/12 Automatic Milling Machine, table 35in. by 10in., speeds 50 to 1,500 r.p.m. British built.

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GRINDERS.

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 BROWN & SHARPE No. 2 Surface Grinder.
 NORTON Surface Grinder, hydraulic, 18in. by 6in.
 JONES & SHIPMAN Fig. 62M Plain Cyl. 8in. dia. by 10in.
 LANDIS 10in. by 18in. Plain Grinder.
 JONES & SHIPMAN 10in. by 27in. Semi-Universal.
 CHURCHILL 24in. by 10in. Universal.
 PRECIMAUX Type UPJ 12in. by 36in. Universal.
 BRYANT 16C 16in. Internal Grinder.

CAPSTAN LATHES.

HERBERT No.0 4in. collet cap. (2).
 MURAD 4in. Capstan Lathes (2).
 SOUTHWARK No. 2 1 1/2in. Capstan Lathe.
 WARD 2A Capstan Lathes (6), with 1 1/2in. collet chucks and bar feed. Machines have 2 speed motors and power feeds to both saddle and turret.
 New MODERN 2C 1 1/2in. bar feed capacity.
 HERBERT No. 3 High Speed Capstan, Air Chucking. Spindle speeds 60-1500 r.p.m.
 DRUMMOND Type K Capstan Lathes (2).
 GISHOLT No. 4 Friction Head Capstan.
 LIBBY 4R 2in. Capstan Lathe. Bar feed.
 BARDONS & OLIVER No. 5 Capstan Lathe.
 HERBERT No. 7 Turret Lathe.
 FOSTER No. 28 Turret Lathe.

CENTRE LATHES.

New BOXFORD 44in. Type A.
 New COLCHESTER CHIPMASTER, 5in. by 20in.
 SOAG OXFORD 64in. Centre Lathe.
 SOUTHBEND 13in. swing taper turning.
 WILLSON 8 1/2in. A.G.H. Lathe.
 CARDIFF 8 1/2in. by 48in. Lathe.
 New COLCHESTER ASCOT 8 1/2in.

MILLERS.

New CHRISTEN Swiss Universal Tool and Die Mill.
 HERBERT No. 1 Horizontal.
 New VICTORIA U1 and U2 Universal.
 ARCHDALE 20in. Horizontal Mills (3).
 ARCHDALE 28in. Horizontal Mill.
 OLIVETTI FP2 Manufacturing Miller. Table 52 1/2in. by 14 1/2in. Longitudinal traverse 39in.
 New GRAFFENSTADEN Model GH3 Plain Horizontal, table size 67 1/2in. by 16 1/2in.
 New TAYLOR Vertical, table 17 1/2in. by 5 1/2in.
 RICHMOND VHM Vertical Mill.
 New GRAFFENSTADEN FV.102 Vertical Mill. Table 51in. by 11 1/2in.; 39in. longitudinal traverse.
 HOLROYD T117 Thread Miller.
 HELLER Automatic Thread Millers (4).

MISCELLANEOUS.

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 New VELOX 7 1/2in. and 10in. Hacksaws.
 New ESSEX 18 Bandsaw.
 New RICHMOND SR2 3ft. Radial Drill.
 New ALBA 18in. Shaper.
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 New Fly Presses up to No. 6.
 All Machines motorised 400/3/50 unless otherwise stated.

LA POINTE SL8 Horiz. Broach 64in. stroke.
 BARNES No. 2 Horiz. Hones.
 LA POINTE Horiz. Hyd. Broach.
 WARD No. 7 Comb. Turret Lathe, 1940.
 NILES 27in. x 27 1/2in. Twin Saddle Lathe.
 ACME-GRIDLEY RA.06 Chuck Auto.
 CHURCHILL No. 1 Planetary Grinder.
 ORCUTT HM24 Gear Grinder, 1944.
 CINCINNATI 1/16, 2/24 Prod. Mills.
 RYDER WILLMAN Horiz. Borer, 3 insp. B. & S. OOG S.S. Autos, 1942.
 CINCINNATI 2/3 C/less Grinders.
 LA POINTE 28L Horiz. Broach.
 VICTORIA U2 Mill, with dividing hds., 1955.
 ACME GRIDLEY 24in. S.S. Auto, 1942.
 MODERN 6in. x 18in. Surface Gdr., 1953.
 CHURCHILL OSV 40in. x 10in. Vertical Spindle Surface Grinder, 1942.
 ARCHDALE 30in. H.D. Pillar Drill, 1942.
 GISHOLT 4.5 and 11-Turret Lathes, 1941-43.
 WARNER & SWASEY 3, 5 and 3A Turrets.
 HERBERT 2D, 4, 4 Senior Turret Lathes. B. & S. No. 3 Vert. Mill, 1942.
 WARD 2A and 3A Capstans, 1942.
 ARCHDALE 18in. and 30in. Vert. Mills, 1942.
 CINCINNATI 2MH & No. 2 Plain Mills, 1942.
 HEALD 48A S. End Borematics, 1941-44.
 DEFAUNE No. 5 Hor. Borer, 3in. sp., 1941.
 B.S.A. 4in. S.S. Automatic, 1941.
 CINCINNATI 1L and No. 3 Vert. Mills, 1942.
 B. & S. No. 2 Universal Grinders, 1941.
 NEWALL 10 by 24/48 Grinders, 1942.
 MONARCH Magnamatic Prod. Lathe, 1946.
 ORCUTT 5in. by 36in. Spine Grinder, 1944.
 V.D.F. 10in. by 72in. Centre Lathe, 1941.
 CINCINNATI 3/24, 3/36 Hydromatics, 1945.
 HERBERT O, 1 and 33 Plain Mills, 1940.
 P. & W. 12B 2-spindle Profiler, 1941.
 KITCHEN & WADE No. 2 Cyl. Home, 1940.
 CHURCHILL NB 6in. x 18in. S. Gr., 1942.
 CHURCHILL Centreless Gr., Model EC, 1940.
 COCHRANE BLY No. 55 Cold Saw, 1940.
 INDEX OR12 S.S. Auto, 4in. cap., 1940.
 FOOTBURY 1in. cap. S.S. Automatic, 1943.
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Pollard 12 AX 4-spindle 3in.
 capacity Drill, in good condition. Table 23in. by 10in. Fully motorised.—BOX Z19, MACHINERY, Clifton House, Euston Road, N.W.1.

Tullis Horizontal Boring Machine 3 1/2in. travelling spindle, 2 1/2in. facing head, 2 motors 400/3/50.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1. Phone: TERminus 0167/8/9.

4ft. **KEETONA** Guillotine. Motorised 400 440/3/50. 14 gauge capacity.
 48in. Treadle Guillotine by 16 gauge.
 RICHARDS Vertical Boring and Turning Mill, 48in. capacity, all geared. Double spindle.
 No. 90 **MIKRON** Gear Hobbing Machine, with Electric Motor on stand.
 H.M.F. Model L70 Power Press, Inclinable. Adjustable stroke 70 tons. Motorised. Tie bars.
 No. 2 **CINCINNATI** Tool and Cutter Grinder. Motorised 400-440/3/50. As New.
 CHURCHILL Universal Tool and Cutter Grinder. Capacity 10in. by 24in. With equipment.
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Conomatic 3 1/2in. 4-spindle Bar
 Automatic, 1943 manufacture, in excellent condition.—BOX V828, MACHINERY, Clifton House, Euston Road, N.W.1.

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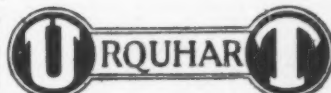
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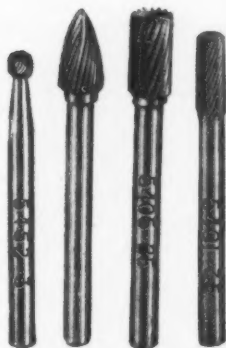
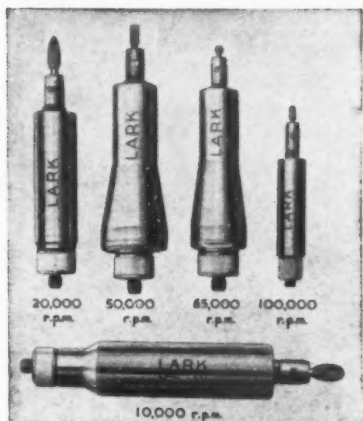
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